VOLUME 24 *Chicago Number* NUMBER 1

THE MEDICAL CLINICS OF NORTH AMERICA

JANUARY, 1940

PHILADELPHIA AND LONDON
W. B. SAUNDERS COMPANY

PUBLISHED BI-MONTHLY (SIX NUMBERS A YEAR), BY W. B. SAUNDERS COMPANY, WEST WASHINGTON SQUARE, PHILADELPHIA.

MADE IN U. S. A.

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ERRATUM: On page 1190 of your September, 1939, Number of the Medical Clinics of North America, the following sentence occurs: "However, we do not advocate the administration, etc." This sentence should read: "However, we do advocate the administration, etc."

Chicago Number

THE MEDICAL CLINICS OF NORTH AMERICA

Volume 24 January, 1940 Number 1

SYMPOSIUM ON GERIATRICS

Advancements in medical knowledge have led to a prolongation of the life span. It is fitting, therefore, that more consideration should be given to the diseases common to old age. Geriatrics today occupies as important a position in medical science as does pediatrics. With this in mind the Editor has planned a Symposium on Geriatrics which he hopes will interest all readers of the Clinics.

The following clinics are included in this Symposium.

Medical Clinics of North America
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CLINIC OF DRS. CLARENCE F. G. BROWN AND RALPH E. DOLKART

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GENERAL REMARKS ON THE CARE OF THE AGED

THE physician who numbers among his patients some of the very old may count himself fortunate. Those who have weathered the buffetings and vicissitudes of nature have acquired with their years a sagacity of which the physician may well stand in awe. The medical management of disease in individuals beyond the sixth or seventh decade of life, however, presents so many unique problems that, as formerly with the practice of medicine in children, it is gradually becoming recognized as a specialized field. In geriatrics as in pediatrics, one deals with individuals with low levels of tolerance. In the aged, the low level of tolerance to metabolic and physiologic disturbances is accompanied by a concomitantly low level of regenerative power, whereas in the younger patients, the low tolerance is compensated by a high regenerative capacity. Categorically speaking, the elderly patient presents a set of such inflexible structures and processes that the stress and strain of either disease or therapy may result in catastrophe.

One may speculate on the reasons underlying the lack in diagnostic skill and understanding which the septuagenarian and above encounters when the physician is consulted. Lack of previous experience with the aged is certainly a significant factor. Since this type of patient is often not ambulatory and is but an infrequent visitor at the clinics, the student receives little or no formal instruction as to his care and treatment. There is little further supplementary training in the hospital and out-patient department because the aged patient rarely enters a hospital unless he is forced to by some acute emergency, such as a fractured hip or acute prostatic obstruction.

Any physician called to advise older people would do well to first meditate on some of the general characteristics of these patients. The life-long individual character pattern becomes less pliable and more accentuated with age. The positive qualities become more positive, and the negative ones more negative. The sweet individual becomes sweeter and, likewise, the sour attributes are also intensified. In general there is an air of oblivion to the cares of the world which lends an atmosphere of mellowness to the aged patient's personality.

The individual who has so long outwitted nature may have more faith in his own regulations and remedies than those a stranger tries to impose upon him. He may also be more conscious of the rapid passage of time and, feeling that his years are numbered, he is less patient with medication or a regimen that does not bring immediate symptomatic improvement. Since the physician is to face an individual who has probably already formed his own diagnosis (and a correct one sometimes at that), it would seem wise to contemplate a simple, truthful, and satisfying explanation of the particular ailment in question. Probably nothing induces greater cooperation from the patient than his feeling that he is sharing the responsibility of the physician in promoting his cure. Foremost should be the resolution to approach the patient, not as a problem, but as a real individual.

Before discussing some of the special considerations in caring for senile patients, it would be well to reflect briefly upon the first important decision the physician must make: *should the patient stay in bed?* Frequently the course of an illness may be entirely changed by this critical decision. So important is the emotional outlook of the aged that many therapeutic procedures must be modified. Although unthought of for the same disease in a younger patient, it frequently is wise to keep an elderly patient sitting up in a chair instead of in bed. In this connection one must consider not only the imminent dangers of hypostatic pneumonia subsequent to being confined to bed, but the profound mental depression the aged undergo when they become aware that disease has at last conquered them and they must take to their bed.

Although from the point of view of the emotional attitude of the patient it is highly desirable to keep the patient out of

bed, due judgment must be exercised. Perhaps the current ideas concerning putting elderly patients to bed arose from observations of the frequent downhill course of elderly patients who are confined to bed because of a fractured hip. This obviously cannot be universally applied to include all illnesses. A patient with cardiac decompensation may require only a few days in bed to achieve compensation and diuresis. Patients with unexplained fevers are likewise best kept at bed rest until a definite diagnosis is established. The best treatment for a patient with hypertension during a transient hypertensive crisis is absolute bed rest.

Psychotic Behavior.—Regardless of the particular medical problem at hand, the most frequent source of difficulty is the onset of psychotic behavior, in the presence of which medical care, which is difficult at best, becomes almost impossible. One of the commonest causes of psychosis is the direct result of attempts at therapy: the *indiscriminate administration of sedatives*. It must be remembered that one of the results of cerebral arteriosclerotic changes is an increased capillary permeability. Whereas an individual with an intact vascular system has a high tolerance for bromides, in the arteriosclerotic they diffuse more rapidly from the blood stream to the cerebrospinal fluid.

This diffusion is so constant that it forms the basis for a test of vascular disease of the brain: Following several days' administration of bromides, the blood and spinal fluid bromide levels are determined. Normally the blood bromide level is about three times that of the spinal fluid. In the arteriosclerotic this ratio is markedly reduced.

Barbiturates must be administered with even more care than bromides. Of all the barbiturates, diethylbarbituric acid (veronal) is excreted almost entirely by the kidneys. The impaired renal function usually present in the aged as part of the arteriosclerotic process would contraindicate the use of this derivative. Barbital and phenobarbital are metabolized slowly and as a result have a prolonged effect. Repeated administration is apt to produce a cumulative effect. The rapid acting barbiturates are apt to produce excitement and psychotic behavior during the peak of the drug effect.

A *minimum of sedation* of any type is therefore preferable

for the aged patient. If a hypnotic is required, it should be prescribed with an awareness of its possible untoward effects. The same limitations which apply to the bromides and barbiturates hold for almost all sedatives, including paraldehyde, chloral, hyoscine, hydrobromide, and the narcotics.

Whisky is a good sedative for the aged patient which is not often considered in the armamentarium of the younger physician.

In addition to toxic psychoses due to sedatives are those resulting from other medication, the most common of which is *digitalis*. The authors have observed numerous instances in which psychotic behavior was the first indication of overdosage.

Too much emphasis cannot be placed upon the *behavior reactions* of the aged patient. Although the clinical, physical and laboratory diagnostic criteria are approximately the same for all decades of life, many diagnoses are missed because the patient is dismissed as a senile dementia or cerebral arteriosclerotic without adequate investigation. Commitment to a mental hospital is a frequent result, whereas cautious investigation and treatment of precipitating causes would have cured the psychosis. Within a period of two months one of us has seen four elderly patients committed to a mental hospital unwarrantedly: the first because of bromide intoxication resulting from medication prescribed by the patient's physician; the second—an acutely hallucinated patient who subsequent to admission was found to have bronchopneumonia; the third, an elderly female with a macrocytic anemia whose psychotic manifestations disappeared after the parenteral administration of liver; and the fourth, an elderly man with arteriosclerotic heart disease in decompensation. Bed rest for a few days and digitalization cured the psychosis.

Urinary retention in the elderly male with prostatic hypertrophy is a common source of difficulty. If gradual in onset, it may even be another cause for psychosis when the blood urea nitrogen becomes elevated. Repeated catheterization or an indwelling catheter for a few days may give temporary relief. The final decision should be made in collaboration with the urologist.

Gastro-intestinal Disturbances.—Disturbances of the gastro-intestinal tract are of course so diverse that only cer-

tain generalizations can be made here: First, because a patient is old, surgery if conservative is not contraindicated. Of non-surgical conditions, one of the most frequent sources of difficulty is obstipation due to fecal impaction. Here the difficulty arises not with the impaction, but with lack of care in performing the rectal examination to make the diagnosis.

Second to obstipation is *constipation*. We do not agree that all elderly patients who suffer from constipation do so because they have atonic bowels. We have seen ulcerative colitis in a patient seventy-four years of age as well as the more common so-called spastic colitis. Although the large bowel may withstand years of purging and catharsis, there comes a time when substitution of a bland diet and the smooth bulk obtained from vegetable mucilage* proves a more effective form of therapy, especially in patients with diverticulosis. This is based not only upon clinical observation but upon observation of the inadequate diets the average aged patient takes. Vegetables are disliked because of chewing difficulties: dentures, or being edentulous, may have originally been the cause for the elimination of this article of diet. Substitution of pureed vegetables and the addition of vegetable mucilage in many instances is all that is required to reestablish normal bowel habits. Because of chewing difficulties many other foods are avoided. If there is a suggestion of *specific dietary deficiency*, adequate vitamin supplements should be provided. As little change in the patient's ordinary dietary habits as is compatible with successful therapy is to be desired. There is no point in the elimination of specific articles of diet such as meat or coffee. Nutritional edema due to low protein intake following prolonged restriction of meat is not too uncommon.

Other General Considerations.—Quite apart from the foregoing considerations are several other problems which frequently arise. Whether or not an aged individual should be subjected to *drastic dental surgery* because of numerous carious and abscessed teeth is a decision best made by the physician rather than the dental surgeon. Although tooth extraction is a relatively innocuous procedure in a young indi-

* Metamucil—prepared and supplied to us by the G. D. Searle Company, Chicago.

vidual, we have observed many severe systemic reactions following multiple extractions in older individuals. Conservative treatment of dental infection with removal of one tooth at a time if absolutely necessary is the safest procedure to follow.

The problem of *anti-syphilitic treatment* of elderly patients must also be seriously considered, especially in this era of Wassermann-consciousness. A patient who has been able to survive to an age of seventy years with a positive serology should be treated cautiously if at all. Small doses of iodides or mercury rubs with careful urinalyses have been found most satisfactory. These drugs should be stopped if an appreciable rise in the pulse rate occurs. Active intensive therapy is apt to cause more harm in the aged patient than no treatment at all.

Lastly, we wish to add a word of caution to the ambitious clinician who believes in the thorough laboratory work-up of each and every patient. The grueling and fatiguing grind of three-day gastro-intestinal tract roentgenologic studies should be considered before nonchalantly rushing grandma or grandpa down to be purged, barium'd enema'd, prodded, and scared by the enthusiasm and equipment of the roentgenologist.

We hope that these general remarks have kindled an interest in some of the problems associated with the care of the aged. The discussions which follow are more specific in character and cover more completely the different problems with which the physician must cope in the field of geriatrics. It is fundamental, however, to recognize that geriatrics is a subject which the physician must approach with patience, humility, and understanding, keeping his more scientific instincts in the background to be used as aids if possible.

Medical Clinics of North America
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CLINIC OF DR. JACOB MEYER

MICHAEL REESE HOSPITAL

THE MANAGEMENT OF DISEASES OF THE GASTRO-INTESTINAL TRACT IN THE AGED

GASTRO-INTESTINAL symptoms are common in the aged. Organic disease of the gastro-intestinal tract is relatively uncommon. According to Rivers,[1] indigestion is a complaint of one-half of the patients between the ages of thirty and sixty, and Barker[2] and his associates have studied the case histories of 300 patients past sixty years of age and noted that the digestive symptoms were second highest in frequency. Barker and his associates found that despite the high incidence of digestive symptoms there were only three cases of gallbladder disease, two cases of ulcer of the pylorus, and two of ulcer of the duodenum.

It is generally recognized that gastro-intestinal symptoms may often be due to disease outside the alimentary tract, as for example, cardiac, renal, arthritic, and hematologic disease. These conditions are particularly common in old age, and may be the particular cause of gastro-intestinal symptomatology.

DIGESTIVE DISTURBANCES ARISING FROM PHYSIOLOGIC CHANGES INCIDENT TO AGEING PROCESS

Digestive disturbances which arise as a result of physiologic changes in the gastro-intestinal tract which accompany the ageing process are as yet not well recognized. Indeed, it is difficult to evaluate gastric digestion in the aged because so little is known and so few studies have been made. My associates and I[3] have shown that in old people, sixty to eighty years of age, there is a decrease in saliva and likewise a decrease in the salivary ptyalin. We were therefore of the opin-

ion that there was a marked decrease or incomplete digestion of carbohydrates in the mouth and stomach of old people. It is an interesting fact that old people eat a considerable amount of carbohydrate food because it is easier to chew and because in institutions for the aged carbohydrates comprise a greater proportion of the diet. We expected to find evidence of incomplete carbohydrate digestion. In a recent study which we[4] made on the gastric and duodenal secretions of old people, however, we found that pancreatic amylase is present in subnormal amounts, but in many instances the concentration of this enzyme reaches that found in young people. Our conclusions from the above study are that the carbohydrate digestion is probably completed in the intestinal tract and that, in old people, the pancreatic amylase is a substitute for the low salivary amylase. Old people, then, according to our studies should have no difficulty in the digestion of carbohydrates.

It has been established as a result of numerous investigations that the incidence of achlorhydria increases with advancing age. It is not within the province of this clinic to enter into a detailed analysis of the factors involved in achlorhydria except to mention that there is much discussion as to whether a gastritis or an inherited predisposition is the underlying factor. I am of the opinion that, in the aged, achlorhydria is due to a physiologic involution associated with senile atrophy. It has been determined that there is a decrease in pepsin in the secretion of the aged, and recently my associates and I confirmed this observation; we also noted, however, that there was a marked decrease in trypsin[4] but that the lipase remained in approximately normal concentration. The rather uniform diminution in the gastric and duodenal enzymes might indicate a physiologic involution and cellular atrophy rather than diffuse inflammatory change.

There is no other literature concerning the activity of the digestive enzymes in old age. In spite of the low concentration of the proteolytic enzymes which our studies indicate, nothing has been written about special difficulties of old people for the digestion of proteins. As mentioned, the problem of mastication in the aged often necessitates the use of a soft diet which is high in carbohydrate and low in protein.

The digestion of carbohydrate, as we have noted, is not markedly disturbed in the aged, and it is likely that although the concentration of proteolytic enzyme is low, the amount is adequate to meet the requirements of a small protein intake. We are, however, aware that there are old people whose protein consumption is fairly large and who likewise have no apparent difficulty in protein digestion.

Restricted Diet.—The restrictions in diet, particularly of proteins, which are often self-imposed or imposed by an over-anxious or over-protective family or family physician, are in my opinion often unwarranted. With few exceptions the majority of old people select both the quantity and quality of food which satisfies their needs and taste. The physician and the family will do well to allow the aged to follow this "natural selection." It may be well at this point to remark that pediatricians have learned that children who are permitted to select their own diet generally select those foods which they require. Relatives of the aged generally think that their parents are not eating enough or are eating too much, and are always insisting upon some special diet. The psychiatrist would probably interpret this as a retaliation by children for parental dominance!

Loss of Appetite.—The problem of appetite in the aged raises innumerable questions and should be a fertile field for study. Carlson[5] quotes Sternberg as saying that the "appetite is in some way associated with the tonus of the muscles of mastication and deglutition and the absence of appetite in nausea is due to atony of these muscles." In the aged it is common to observe changes in the tonus of the musculature of the mouth. Appetite may be absent and there is no complaint of nausea. Carlson regards "a certain sensation complex from the viscera and a normal state of central correlation as a necessary background for appetite. Given this background the essential element in appetite is the memory process of past experience (sight, smell and taste) with palatable foods. These memories are reinforced by present stimulation of these nerves by food." The accompanying disturbances in sight and the changes which are said to occur in the taste buds and in the sense of smell may therefore readily explain the absence or diminution of appetite in the aged. Other factors such as

the diminution in salivary and gastric secretions and the changes in the hunger contractions, may play a rôle.

The problem of stimulation of appetite is of great interest and importance. Vitamin B is apparently quite effective, and it probably acts by decreasing the emptying time of the stomach. The use of bitters and alcoholics is too well known to elaborate upon.

Loss of Teeth.—Loss of the *teeth,* or a set of poorly fitting teeth, is a matter of serious concern to most old people. The difficulty in mastication necessitates a change to a soft or liquid diet. The importance of mastication in digestion is probably over-emphasized by the laity, and some physicians share in this error. It is well to recall that digestion occurs chiefly in the stomach or small intestine. The enjoyment of food that comes from proper mastication is important to the aged, and the condition of the teeth and mouth should therefore receive the attention of the physician or the dentist.

Glossitis.—The appearance of the *tongue* is important to the aged. It is a common belief among them, which may have some justification, that the appearance of the tongue mirrors their general condition. Likewise it is the general belief that it is an index of the activity of the bowels. Old people become easily disturbed because of a coated or furred tongue, or because of large veins in the tongue. I have known many old people to spend hours cleansing their tongue or taking innumerable cathartics in the hope of clearing it.

An adequate explanation of coated tongue is still wanting. The old observation that lycopodium spores placed in the rectum are to be found on the tongue indicates the rôle of reverse peristalsis, but there are undoubtedly many other factors which are yet to be explained. A dry tongue may not only indicate a lack of fluids, a diminished salivary secretion, but may be the sign of an atrophic glossitis. Glossitis may be associated or due to: (1) anemia of the aged, (2) achlorhydria, (3) vitamin deficiency, (4) pernicious anemia, (5) Plummer-Vincent's syndrome, (6) psychogenic factors. The first four conditions mentioned have so many similarities in the clinical picture that it may be difficult to establish the specific cause.

We are not quite certain of the mechanism involved in the production of a glossitis. It is claimed that liver therapy

improves the glossitis of pernicious anemia. Much may be accomplished by a high vitamin diet in the glossitis of deficiency diseases. In Plummer-Vincent's syndrome, iron and liver therapy will alleviate the condition. Burning sensations in the tongue and soreness are a source of distress in all the conditions mentioned above. Psychogenic sore tongue is more common than is generally realized, and proper elucidation of the etiology may only follow after a long and patient analysis of the history. The ever constant fear of carcinoma of the tongue must likewise be remembered.

DISEASES OF THE STOMACH

The incidence of *achlorhydria* increases with advancing age. According to Ivy,[6] "above the age of sixty, 35 per cent of people do not secrete acid when they eat a meal, and 28 per cent do not respond to histamine." Our own observations on the gastric secretion in the aged correspond to the above. We also noted a marked decrease in pepsin and in trypsin.

Little is known about the *emptying time,* and the *size* and *shape* of the stomach in the aged. Recently at my suggestion we determined the size of the stomach of four old men between sixty and seventy years of age by means of the barium meal. The size, shape and position of the stomach and the emptying time were found to be normal. For these studies I am indebted to Dr. Robert Arens and Dr. S. Mesirow of the *x*-ray department of Michael Reese Hospital.

The diseases of the stomach in old age which we should give special consideration to are: (1) carcinoma; (2) peptic ulcer; and (3) gastritis.

Carcinoma.—I shall not detail the ordinary symptom-complex of carcinoma of the stomach. In the aged, the suspicion of a carcinoma of the stomach must be entertained whenever there is a story of digestive discomfort related to food. As in the young and middle-aged, so in the old, the *fear* of carcinoma is often the cause of a train of symptoms which may duplicate the disease. A story of epigastric distress which is relatively short in duration and which becomes persistent should arouse the suspicion of carcinoma. The following table is taken from Eusterman and Balfour[7] and shows a rather interesting age incidence of gastric carcinoma:

TABULATION

NUMBER OF PATIENTS REPRESENTATIVE OF THE VARIOUS DECADES OF LIFE AT ONSET OF SYMPTOMS OF GASTRIC CARCINOMA

Decade of life.	Onset of symptoms.	
	Male.	Female.
41–50	53	17
51–60	57	27
61–70	50	14
71–80	3	5
81–90	1	0

It can of course be readily understood that there are relatively few who live to the age of eighty and over—which may account for the low incidence of carcinoma at this age. Therefore, the problem of carcinoma above the age of seventy is not a serious one. It would appear that between the ages of sixty and seventy, the incidence of carcinoma of the stomach is almost equal to that of the middle-age group.

Peptic Ulcer.—It is generally agreed that this is a disease of the young and middle-aged groups, and that it may exist for twenty-five years or more. The majority of observers are of the opinion that gastric and duodenal ulcer rarely occur in the aged. Ivy makes the statement, quoting Dublin and Lutka, that the death rate from gastric and duodenal ulcer becomes progressively higher with age up to seventy-five years. In my own experience I have seen a number of patients past sixty in whom it was possible to obtain a history of ulcer symptoms which first began after the age of sixty. In two instances, hyperacidity was present and in two we have no records of the degree of acidity. In the first two mentioned, perforation of the ulcer occurred despite management by alkalies.

In a recent study of peptic ulcers seen at autopsy, Dr. Saphir and I have pointed out that there are instances of chronic peptic ulcer in which the ulcer is the primary disease, and that there is another group of ulcers in which the ulcer is

secondary to disease of the liver or gallbladder or accompanies a cardiac or renal lesion or prostatic disease.

The latter group are common in the aged. Hemorrhage may occur in these cases of acute ulcer and be the cause of death. Likewise, perforation may occur. The syndrome of peptic ulcer may be masked or misinterpreted as reflex symptoms due to a cardiac or renal lesion and the seriousness of the gastric condition be entirely overlooked. I have observed a number of patients postoperatively—one especially, following prostatic resection, who developed gastric symptoms and who at postmortem showed two small gastric perforations which were the cause of death. It is likewise a common experience that peptic ulcer in the aged often produces severe gastric hemorrhage. This is explained as being due to arteriosclerosis of the gastric blood vessels. I am of the opinion that in addition to this factor, hemorrhage in some instances is due to an acute ulcer or to a severe gastritis.

In the management of a severe gastric hemorrhage in the aged it is important to remember that the rigidity of the sclerotic vessel wall will favor continued bleeding, and that surgical interference may be the procedure of choice in such instances. Likewise, the fast pulse usually observed in severe hemorrhage may be absent in the aged, but the pulse may be slow, giving the inexperienced the impression that the hemorrhage has ceased.

The frequency of perforation of peptic ulcer in the aged is not easy to explain. If the activity of the ulcer is dependent on the digestive action of free hydrochloric acid and pepsin, one would expect fewer perforations in the aged because of the diminution in the acid and enzyme.

A gastric ulcer of long duration in the aged always raises the question of malignant change. While this occurs, it is not as frequent as generally believed. It is not inconceivable that a benign gastric ulcer and a malignant lesion may co-exist. Such cases have been reported. I have seen a patient who had a subtotal resection for duodenal ulcer and who eighteen years later was observed to have a carcinoma of the stomach.

The problem of *differentiating* chronic peptic ulcer, chronic atrophic gastritis, and gastric carcinoma is not easy. There is much that is common in the general symptomatology of

these conditions. While it is known that from 50 to 60 per cent of all gastric carcinomas are associated with achlorhydria, it is now well recognized that free acid may be present. Free hydrochloric acid may be diminished in gastric ulcer, but its absence in duodenal ulcer is unknown. *Gastroscopy* in the hands of an expert may serve as an early diagnostic measure.

Old men have gastric and duodenal ulcers which are easily recognized by the story of "chronicity and periodicity," and complications, such as hemorrhage and perforation, may occur. Old men have peptic ulcers which may be associated with coronary sclerosis, arteriosclerosis, and coronary thrombosis. These lesions may be coincidental or may be unrelated. The recognition of the association is often overlooked. *Of particular importance is the fact that old people having arteriosclerosis or coronary sclerosis may have a clinical syndrome of peptic ulcer.* So-called "indigestion" masking heart disease is a most common error of diagnosis. It is well to remember the statement of Broadbent that *when the symptoms in the aged are gastric, suspect the heart.* In the aged, with or without any evidence of cardiac failure, the story of postprandial distress may simulate in every respect the clinical picture of peptic ulcer. Sometimes the clinician may detect one or more clinical facts which may serve in the differentiation. Thus I will briefly relate to you the history of a man sixty-seven years of age who had postprandial distress only if he walked to the street car immediately after meals. If he rested for an hour or longer after a meal, he was able to walk without any distress and continue his activities. Or again, I have observed two patients, one seventy-four years old and the other seventy-six, who in addition to distress after meals had a feeling of constriction in the chest, would perspire, become uncomfortable, but would be immediately relieved by $\frac{1}{100}$ grain of nitroglycerine.

It is well to suspect a coronary sclerosis or angina pectoris in such instances. The electrocardiographic findings may be negative or questionable. These patients often take soda for relief, and in most instances do not obtain it. As mentioned, nitroglycerine will give immediate relief. I have found that small tonic doses of digitalis are of value in such instances.

Small portions of food at meals or at frequent intervals, rest following meals, the use of vasodilators, derivatives of the theobromine group, are well worth using. Spirits of peppermint following a meal, or occasionally a small dose of whisky during an attack, may give relief to the patient.

Gastritis.—I use the term "gastritis" as indicating a symptom complex without any correlation of the pathologic and gastroscopic findings. I would suggest the following classification of gastritis in the aged: Gastritis due to: (1) cardiac disease, (2) renal disease, (3) blood disease, (4) carcinoma, (5) syphilis, (6) postoperative gastritis, (7) physiologic senile involution, and (8) inflammatory gastritis.

The relation of gastritis to the anemia of the aged is unquestionably one that requires further study. The relation of pernicious anemia to gastritis is not thoroughly settled. Certain dietary factors may be of greatest importance in understanding the gastritis of the aged. It is possible that these dietary factors may likewise be important in the gastric and duodenal secretions of the aged. The symptom-complex of gastritis varies from epigastric discomfort to a multitude of symptoms, such as sore mouth, sore tongue, belching, etc. Disturbances of appetite of varying degree are present, and not infrequently the mental attitude of the patient is one of depression, in many cases bordering on melancholia.

Administration of hydrochloric acid in moderate quantities is often of value, while pepsin alone or in combination with other digestive enzymes is said to have therapeutic merit. Likewise, vitamin B, administered parenterally or by mouth, may give symptomatic improvement.

APPENDICITIS

Appendicitis occurs in the aged but is often unrecognized. It is generally believed, however, that appendicitis does not occur and that when it does the symptom-complex is very atypical. I am not of this opinion. I think the difficulty lies in the fact that appendicitis is not considered as a possibility. Rather, such conditions as mesenteric occlusion or intestinal obstruction from other causes are more often thought of. Ivy quotes Mares as stating that "the high mortality is due to atrophy of the protective lymphoid tissue and to lowered re-

sistance." I am not quite willing to accept this entirely. Many old people are able to survive severe septic processes, and the question of lowered resistance is indeed a very relative one. For example, I can relate the experience of an old woman of sixty-four who recovered from an acute suppurative appendicitis following operation, only to die two years later because of a simple cataract operation.

GALLBLADDER DISEASE

Studies by Boyden and Granathan,[8] on the rate of evacuation of the gallbladder at different ages indicate that the rate does not change with age. It is known, however, that the incidence of gallbladder disease increases with age.

Gallbladder disease, like peptic ulcer, may mask a cardiac lesion or be associated with it, or it may aggravate the cardiac symptoms. In coronary sclerosis with anginal syndrome it is difficult to evaluate how much of the symptomatology may be due to an infected gallbladder, if present. While numerous observers direct attention to the benefits which arise from removal of an infected gallbladder in such cardiac irregularities as extrasystoles and paroxysmal tachycardia, I am of the opinion that in the aged it is far better to avoid surgery. Such conditions as empyema of the gallbladder may necessitate surgical interference, but it is well to remember that even this condition may subside and the patient recover.

I should like to call attention to two cases of gallstones, both in women past seventy, in which the gallbladder symptoms were atypical. In one patient the complaint was severe headache and vomiting. There were no other gastro-intestinal symptoms and no local findings over the gallbladder area. The patient had been previously observed by numerous physicians and various diagnoses had been made, but disease of the gallbladder was not considered. At the time I observed the patient, there was a moderate elevation of the icteric index. She developed a chill and fever but no pain. A diagnosis of stone in the common duct was made. Operation revealed the stone in the common duct and relief of symptoms followed. The second patient likewise had a syndrome of headache. It was followed by a typical picture of collapse. There were no abdominal signs or symptoms. Cholecystography revealed

stones in the gallbladder. I saw this patient in consultation and advised against operation, my opinion being that the gallstones were unrelated to the symptomatology. However, the patient was operated on and relief of symptoms followed for a period of one year. At the end of this time the clinical symptoms recurred. Chill and fever were now associated. There was no pain. A diagnosis of stone in the common duct was made. Operation was performed, a stone removed, and the patient relieved of symptoms.

CONSTIPATION

The problem of constipation in the old, as in the young, is an individual problem. It is impossible to dissociate any factor in the individual's daily life from the rôle it may possibly play in constipation. This is particularly true when constipation becomes the chief concern of the patient. The resulting symptoms may depend entirely on the importance the patient attaches to the whole question.

It may not be amiss in this connection to say that some physicians have been guilty of exaggerating the importance of bowel movements. The physician who explains to his patient, whether old or young, the fact that one bowel movement a day or at longer interval is all that is necessary may effect a cure of the most stubborn case.

It is said that constipation is common in the aged, but it is equally true that many old people are not constipated. *Habitual constipation* is common in the aged. I prefer to use the term *conditioned constipation*. The loss of muscular tone of the abdominal muscles and sedentary habits of the aged are recognized factors in delaying the normal bowel movements.

Atonic constipation, implying atony of the musculature of the intestine, is said to occur. I am not quite in accord with this opinion. Drs. Arens and Mesirow and myself examined the colons of the four old men previously mentioned and the fluoroscopic examination and *x*-ray films showed *normal peristalsis and good intestinal tonus*. The emptying time of the colon was apparently normal in every instance. We were unable to see any mass movements of the intestine.

Dietary changes in the aged, particularly in the edentulous, are undoubtedly a contributing factor in constipation. The

diminution in proteolytic enzymes may play a rôle. While saline cathartics are said to result in cathartic colitis, I doubt whether this can do much harm to the aged. An occasional saline cathartic may be used from time to time with great benefit. The vegetable cathartics are well known and should be used. Likewise, there is no objection to such preparation as mineral oil or any emulsied forms of mineral oil.

Rectal constipation is probably the most common form of constipation in the aged. It often leads to fecal impaction. The symptoms which are generally present are discomfort, fulness in the rectum, and inability to have a bowel movement. These symptoms may become so severe as to give rise to a clinical picture simulating intestinal obstruction.

Fecal impaction occurs not infrequently in the aged. When simple enemas of soap and water, or even more vigorous enemas of milk and molasses, are not effective, manual removal may be the only method which will give relief. Constipation in the aged as well as in the young always calls for a thorough examination, particularly rectal examination, and should be followed by a proctoscopic examination.

Constipation or diarrhea, or both, is often present in rectal carcinoma. The sudden onset of constipation with no previous difficulty in bowel habit should direct attention to the possibility of a *carcinoma* of the rectum.

DIVERTICULOSIS AND DIVERTICULITIS OF THE COLON

This condition is most common in individuals between fifty and sixty years of age. *Diverticulosis* is a radiologic diagnosis, clinical symptoms being entirely absent. I am of the opinion that too much emphasis is placed on such radiologic findings. Diverticula are most common in the descending and sigmoid colons, but may occur at any point in the large bowel.

Diverticulitis implies an acute inflammatory reaction in a diverticulum. It is assumed that the diverticula become secondarily infected from retained fecal material. Such inflammatory changes may progress and lead to suppuration, local perforation and peritonitis. The symptom complex consists generally of acute, localized, abdominal pain, often on the left side, associated with fever and leukocytosis. Left rectus rigidity and muscle spasm may be present. The diagnostic problem

is to determine the nature and severity of the process and whether the lesion has become localized. My own experience has been that the majority of these lesion become localized and resolve without extension or complications. There are many surgeons and internists who regard acute diverticulitis as a major surgical problem and advise immediate operation. There are undoubtedly some cases requiring surgery, but in my own experience they are rather the exception.

It is likewise important to determine whether diverticulitis is associated with or due to an ulcerating carcinoma. At times it may be impossible to make this differentiation. The roentgen shadow and pneumocolon may be of value. The multiplicity of diverticula in the colon generally favors the non-malignant character of the lesion.

When considerable pus is found in the stool, the diagnosis of a benign infected diverticulum is favored. If the suspicion of carcinoma is entertained, surgical interference is a consideration provided that other factors do not contraindicate.

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Medical Clinics of North America
January, 1940. Chicago Number

CLINIC OF DR. G. K. FENN

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CARDIOVASCULAR DISEASE IN THE AGED

IN discussing the cardiovascular diseases of old age, one is at a loss for an accurate place to begin the discussion. Diseases which only a few years ago were considered the special prerogative of older people now have become the property of middle-aged and younger individuals. In addition to this difficulty, when one considers his patients who are past seventy, it is surprising how few of them have frank clinical cardiovascular disease. It would appear that the usual types of heart disease remove the patient from the scene before he reaches seventy. It is to be hoped, however, that as our knowledge of the proper treatment and management of heart disease increases we shall be able to bring more and more patients with heart disease into the seventh and eighth decades. Until someone successfully completes the quest of Ponce de Leon for the fountain of youth, blood vessels will continue to degenerate and patients will continue to show the effects of such degeneration. Our task for the present seems to be to retard degenerative processes that we are powerless to prevent, and to use our material with enough intelligence so that we may make it serve the patient for a longer time.

The almost universal cause of heart disease of old age is arterial degeneration. It has been fairly well demonstrated that coronary artery degeneration is present in most people of fifty. The presence or absence of clinical heart disease at seventy depends upon the speed with which the degenerative process moves, and to a lesser extent upon the vessels that develop the greater damage. The greatest deterrent to this degenerative process is, to quote the old bromide, care in selection of one's ancestors, but this is not very helpful advice. Assuming that one is reasonably fortunate in his ancestry, or

even if he be unfortunate, is there any general plan he may follow to retard this degenerative process? To discuss the method of retarding degeneration is to court trouble and disaster. There are few things about which there is a greater diversity of opinion than about the means of achieving longevity, and to attain longevity one must have a fairly good cardiovascular system.

At the risk of stirring up controversy, I shall set out but a few, a very few, of the things that are credited with accelerating the degenerative process. A fairly good case has been built up against the excessive use of tobacco. Several well-controlled observations indicate that intemperance in the use of tobacco tends to encourage cardiovascular disease. Dr. Pearl's work shows a definite divergence in the survivorship lines between non-users and heavy users of tobacco, with the moderate user somewhat less affected. The same study shows the excessive use of alcohol to be an obstacle to longevity. The moderate user of alcohol, however, appeared to be at no disadvantage compared with the total abstainer. It may well be that intemperance in other habits has a similar deleterious effect, but acceptable evidence is so far lacking.

A most interesting observation occurred in Dr. Pearl's study of some 2,000 nonagenarians and centenarians. This group exhibited just as wide a divergence of habits as the general population. Some were consumers of liquor, some were total abstainers. Some used tobacco, others did not. Some ate sparingly, others were gluttonous and so on. There was but one characteristic that ran generally throughout this group. The vast majority of them were of placid disposition and seldom worried. This led Dr. Pearl to the statement that "the length of life is generally in inverse proportion to the rate of living."

Consider for a moment the inferences that may be drawn from that statement. They are almost unlimited. If it is true that the rate of living controls to any degree the degenerative process, is there anything we can do about it? Unfortunately, we cannot fully answer that question at this time. Here again heredity comes in. Some of us are naturally vigorous and active. We are not happy unless we are constantly engaged in some occupation requiring the expenditure

of considerable energy. Others of us are much happier while engaged in a sedentary occupation of a meditative variety. It is very difficult to change the leopard's spots, particularly after sixty. But we can make the effort that would seem worthwhile to do it.

The medical climatologist contributes another interesting viewpoint that offers opportunity for further speculation. This gentleman would say that the tempo of life was governed by climatic environment. He would explain that hypertension and arterial disease are less common in tropical and subtropical climates, not because of racial and hereditary differences, but because the drive of life or the "rate of living" is much slower. He would say that the middle temperate zone of this country, with its rapid temperature fluctuations and its storm stresses, promotes a great zest for life and a passion for accomplishment, but it accelerates the degenerative processes. Dr. Mills has published some careful studies of this problem and he shows that long periods of relative climatic stability are reflected in the decrease of deaths from arterial disease, while periods of continuous storm stress show a corresponding increase of such deaths. He shows further that migrants from subtropical regions into the more invigorating climate farther north die earlier from cardiovascular disease than do their fellows who remain at home. This is not to say that the climatic environment is the cause of arterial degeneration. It merely brings up evidence that the climatic environment may speed up the tempo of life, or "the rate of living." Whether or not this in turn accelerates the degenerative process is surely worthy of consideration.

Prophylaxis.—These, then, are the instruments at our disposal with which we must attempt to retard the degenerative process. These instruments are too few and too uncertain, but they are the best we have and we should use them. We must caution our geriatric patient against the excessive use of *tobacco*, although I still have some doubt about the advisability of completely breaking off a habit that has existed for fifty years. We must insist on moderation in the use of *alcohol*. This is not to say that teetotalers are to be started on moderate alcoholic careers. I am speaking of the patient who is accustomed to using alcohol. We must encourage *temperance in*

all activity, and an honest attempt to slow down the tempo of life. The patient should avoid situations that stir up controversy and great emotional stress, and there seems to be fairly good evidence to advise him to "follow the sun." At least this last affords us northerners an excellent excuse for winter vacations in the south. So much for the prophylaxis of cardiovascular degeneration.

TREATMENT OF PATIENTS WITH CLINICAL EVIDENCE OF HEART DISEASE

Now we come to the problem of dealing with those older patients who come to us showing clinical evidence of heart disease. As I stated earlier, the vast majority of patients of this type will have primarily blood vessel disease with the cardiac disease as a result.

Diminution of Cardiac Reserve.—Many of them will have nothing more than diminution of the cardiac reserve. There will be a little breathlessness on exertion perhaps, or a bit of tightness beneath the sternum. There may be a little hypertension, but just as often the blood pressure is normal or low. There will be little or no structural change in the heart demonstrable by physical or *x*-ray examination. Such patients are encountered in periodic health examinations or they may come in as a result of reading newspaper articles; or perhaps some friend may have died of heart disease.

These patients should not be treated too vigorously. The greatest good may be obtained by wise management and not from the administration of drugs. Avoidance of the exertion known to bring on distress, a short rest period following meals, and a less strenuous emotional life will frequently bring about relief. I shall discuss these things more fully in dealing with the succeeding group. Because this distress is probably based upon an insufficient coronary flow, I give one of the purin base compounds, usually with considerable benefit.

I believe that digitalis should be avoided in this type of patient. Digitalis has been recommended as a prophylactic against heart failure. This is, of course, a debatable question, but my own experience would lead me to believe that digitalis in situations of this sort gets patients into trouble rather than keeping them out of it.

Anginal Pain on Exertion.—Next in this age group we shall encounter a number of patients who develop marked anginal pain on exertion. These patients will usually have evidence of arterial disease elsewhere. They will frequently have hypertension, and anatomic changes may be found in the heart. The pain and distress in this group is not only uncomfortable, it is frequently disabling. There may be sharp attacks of angina pectoris and these patients are candidates for coronary occlusion. Electrocardiographic changes will indicate the presence of coronary artery disease.

Each of these cases requires close and careful study. The general plan of treatment is the same for all, but there are so many variable factors in each case that only the closest scrutiny will reveal them. The type of exertion that produces pain most readily must be determined. It is surprising how variable is the response to exertion. Pain may be caused by certain types of exertion that require much less effort than other types which produce no pain at all. One of my patients can work about his garden, rake his lawn, and even split a little firewood without discomfort, but walking to the train in the morning brings on acute pain.

When the peculiar responses of the individual patient are determined, we are in a better position to aid him. Pain producing effort should be minimized or abolished, but it is unwise to change the habits of the patient completely unless it is absolutely necessary. It is difficult to teach the old dog new tricks, particularly after seventy, and generally speaking it is better to have the patient engage in some sort of occupation. Rest following meals is most desirable in these situations. The coronary flow increases by a considerable amount following the ingestion of food, and to make additional demands upon the coronary circulation creates a situation that an impaired coronary flow cannot meet. I believe that many of the coronary accidents that occur on the golf course are due to swinging the driver too soon after the ingestion of food. Careful attention should be paid to the bowel. Straining at stool is a hazardous procedure, and pain comes on much more readily when the bowel is filled with gas. Emotional stress, either business, political, or domestic, must be carefully avoided. Some one always gets into trouble at the World Series, and the

present international situation is going to kill others than the soldiers. Remember John Hunter's remarks, "my life is in the hands of any rascal who chooses to worry and tease me."

Medication should be directed toward increasing the coronary blood flow. For immediate relief of pain, nitroglycerine under the tongue has few if any superiors. As permanent coronary dilators, the nitrites are not as useful as the purin base compounds. Theobromine salts or theophylline salts will be found effective in a high percentage of cases. My personal choice runs to theobromine calcium salicylate or theophylline with ethylenediamine (aminophylline). Alkaloid theobromine also proves quite satisfactory. Phenobarbital to relieve emotional tension is valuable, but I do not care for combinations of theobromine and the barbiturates. They seem to me to be too inflexible; one cannot vary the dose of one constituent of the mixture without changing the dose of the other constituent at the same time.

Hypertension.—In this age group there will be found a few hypertensives. They will show for the most part systolic hypertension, that is to say, the systolic pressure will be elevated to a greater degree than the diastolic. These patients will complain for the most part of breathlessness and easy fatigue, and in this group will be found the cases of congestive heart failure. Examination will reveal evidence of arteriosclerosis and there will be cardiac enlargement. The *x*-ray will demonstrate an elongated aorta, with the typical aortic knob. The arteriosclerosic process will often affect the larger vessels of the leg, with resulting pain and muscle cramp.

This group of patients is best treated symptomatically. The general management is much the same as in the preceding groups, and medication should be very moderate. In the treatment of the geriatric patient, I am convinced that moderation on the part of the doctor is just as desirable as moderation on the part of the patient. Certainly no serious effort should be made to lower the blood pressure. Remember that the coronary flow is a function of the blood pressure and that an increased blood pressure carries with it an increased coronary flow. An enlarged muscle mass requires an increased coronary flow. So in this respect the elevated blood pressure is not an unmixed evil. It is worth making an effort to further increase

the coronary flow through the use of the purin base compounds, although the sclerotic artery does not lend itself well to dilatation. When heart failure complicates the picture, the treatment is the same as it is for heart failure in any other patient, and the treatment for heart failure is so well known that I need not go into it here.

Abnormal Cardiac Rhythm.—The elderly patient is occasionally beset by abnormal rhythms. The occurrence of *extrasystoles* as a rule demands no special treatment. Often the ectopic beats may be abolished or greatly reduced by careful attention to the bowel. If the ectopic beats are quite annoying to the patient and become a mental hazard, increasing the coronary flow by the method previously discussed may be helpful. If this fails, the cautious use of quinidine may be warranted. It seems to me to be unnecessary and unwise to make a fuss over extrasystoles as such.

Heart block is likely to be a very bothersome occurrence, particularly when it reaches a high degree and is associated with Adams-Stokes' disease. Unfortunately, I am unable to give much helpful information concerning the management of heart block. Improvement of the coronary flow is the logical procedure and sometimes works very well. The use of barium chloride and thyroid substance in complete dissociation is well known and frequently not very helpful.

Auricular fibrillation.—Auricular fibrillation occurs frequently enough to merit discussion. In the usual type of auricular fibrillation—that due to rheumatic heart disease or thyroid disease—the ventricular rate is usually high and much of the disability of fibrillation is due to the fast rate. In the elderly patient the onset of fibrillation often elevates the ventricular rate surprisingly little. It is probable that the degenerative process produces enough damage in the conducting tissues to prevent a rapid ventricular rate.

In many instances the occurrence of fibrillation is an indication for the administration of digitalis, but in many of the elderly patients there is a digitalis-like effect without the use of the drug. In this situation I would urge serious consideration of all the factors before prescribing digitalis. In the absence of heart failure it will do little good and harmful results are not without the range of probabilities. In the aged,

the use of quinidine to restore a sinus rhythm is a procedure that is not to be lightly undertaken. A normal rhythm is always desirable, but it is not good practice to push the patient into heart failure to obtain such a rhythm. It must be remembered that quinidine is a cardiac depressant. With a fairly good myocardium, quinidine administration is without appreciable danger. With a poor or failing myocardium, the wisdom of prescribing this drug must be carefully weighed. No inflexible rule may be laid down. Each case must be considered on its own evidence.

ACUTE CORONARY OCCLUSION

The major cardiac emergency that arises in geriatric patients is the occurrence of acute coronary occlusion. The signs and symptoms of acute coronary occlusion have been described elsewhere. The pain, falling blood pressure, fever, leukocytosis, the friction rub and the increased sedimentation rate, are no different in the aged than they are in the younger patient. The subsequent management of the patient with a coronary occlusion is fairly well standardized. I shall devote the remainder of the time that is left to me to a discussion of the acute emergency:

Immediate and complete rest is, of course, essential. Lately we have come to value the administration of oxygen more highly. There is no time to go into the physiologic reasons for this. If we are reasonably certain of the diagnosis, we administer oxygen at once at least for the first few hours, whether or not there is any clinical indication. There is reason to believe that it puts the heart at a considerable advantage and it is not necessary to have the presence of cyanosis, pallor and dyspnea to obtain this advantage.

The method of administration is one of personal choice, so long as the concentration of oxygen is sufficient. One has the choice of a face tent, a Boothby mask, a bed tent, a nasal catheter, or an oxygen room—any of which will deliver an adequate concentration if properly administered. The length of time over which the oxygen is continued is left to the judgment of the physician.

For a long time there has been reason to believe that the very serious state following coronary occlusion was produced

in part by something besides the occlusion itself. Patients have come to autopsy with such a small infarct in the heart muscle that it would seem impossible that death could result from this cause alone. Dr. Hall, working in Sir Frederick Banting's laboratory, has brought forth evidence indicating the occurrence of a general constriction of the coronary arteries as a result of coronary occlusion. He has presented further evidence to support the view that this constriction is the result of impulses mediated through the vagus.

These experiments have caused us to ponder a bit on our drug treatment of acute coronary occlusion. Morphine has long been a sheet anchor to reduce pain and enforce rest. It must still be used in many cases because there is no adequate substitute for it as an analgesic. Morphine, however, sensitizes the vagus and might thus accelerate the reflex coronary constriction. It has no direct effect upon the coronary flow volume. Papaverine, on the other hand, does not augment vagus activity, and there is some experimental evidence to indicate that papaverine increases the coronary flow. This drug has some analgesic property but, unfortunately, cannot quite equal morphine in this respect. There will be a certain number of cases in which papaverine will meet the requirements entirely, and it would seem logical to use it. In cases where papaverine will not control the pain, its use will permit a reduction in the amount of morphine. The ability of atropin to block the vagus effects is well known. In those cases where reflex coronary constriction is a dominant factor, atropin may play an important rôle.

It is our practice to treat this emergency with papaverine and atropin and to keep the morphine to a minimum compatible with comfort. In addition to these drugs, the intravenous or intramuscular use of theophylline with ethylenediamine is of great benefit, particularly when there is pulmonary edema or great dyspnea.

To recapitulate, then, *rest, oxygen, papaverine* and *atropin,* with *morphine* when necessary and sometimes *amino-phylline,* constitute the emergency treatment of acute coronary occlusion. There may be other devices or remedies that are of value, but these are the important ones.

OTHER TYPES OF HEART DISEASE

You will note that I have disregarded *rheumatic heart disease, syphilis,* and *essential hypertension with heart disease.* I have done so intentionally. Occasionally we encounter such diseases in the aged, but not often. When we are required to treat one of these diseases in the aged there is no great difference in the treatment because of the fact that the patient is a few years older, except for the use of greater moderation in treatment.

Let me repeat, in the care of the geriatric patient, moderation on the part of the doctor is just as necessary as moderation on the part of the patient.

Medical Clinics of North America
January, 1940. Chicago Number

CLINIC OF DR. JAMES G. CARR

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DISEASES OF THE LUNGS IN THE AGED: CHRONIC PULMONARY EMPHYSEMA, CHRONIC BRONCHITIS AND PNEUMONIA

Chronic Pulmonary Emphysema.—A man of seventy-two, a native of Poland, was recently admitted to the Evanston Hospital through the out-patient department. The patient spoke almost no English, but with the aid of an interpreter it was learned that his chief complaint was abdominal pain; this was severe at times, and worse during the past eleven days. Physical examination revealed a large abdominal aneurysm. Incidentally, from the patient's standpoint, there was given a history of chronic cough persisting for years. This was most severe at night and in the winter, and it is with this latter phase of the patient's complaints that we are here interested.

The difficulties already mentioned made a satisfactory history impossible. The patient was thin, old and feeble. The abdominal pain was at times severe, the pulmonary symptoms being minor in comparison. The pulse rate was 72; the respirations over four days (the patient being in bed) varied from 20 to 36. The temperature varied from 98.6 to 99.6° F. by mouth. The blood pressure was 130/86. The patient was markedly cyanotic. The pupils were normal. Other reflexes were not satisfactorily elicited, largely because of failure of cooperation on the part of the patient. The liver edge was four fingers' breadth below the right costal margin. In the middle of the abdomen there was a pulsating mass about the size of an orange. The fingers were definitely clubbed and the toes showed changes of the same type.

The chest was enlarged, especially in the anteroposterior diameter. The percussion note was hyperresonant, except for

a small area in the left midclavicular line extending from the fifth to the seventh rib. The breath sounds were everywhere distant except for the area just noted. It was impossible to determine the cardiac borders. The tones could only be heard along the sternum. The rhythm was regular. The electrocardiogram showed a right axis deviation. The *x*-ray report included these statements: "There is a high grade of emphysema with a depression of the diaphragm—both sides. The cardiac shadow is centrally placed."

Another patient seen not long before this presented many of the same symptoms. Three significant features were present that were not disclosed in the case already described. The erythrocyte count was high (5,950,000 and 6,810,000 per cubic millimeter on two counts), with a hemoglobin value of 18 and 19 gm. per 100 cc. The electrocardiogram showed a definite right ventricular preponderance. The patient accidentally showed the presence of allergic reaction: Following the ingestion of 5 grains of aspirin to relieve some joint pains he had a severe attack of asthma with laryngeal obstruction, cyanosis, and a pulse rate of 140. He responded promptly to adrenalin. Upon two other occasions while in the hospital he had frank attacks of bronchial asthma.

In the first case the history of asthma was not elicited; in the second case asthma had been present for some years. Both patients had emphysema, a common type of disease which often develops as a result of asthma but which also occurs as the final process in various types of bronchial disease, infective or mechanical. The result is a permanent impairment of respiratory function, and an increase of the work of the heart with enlargement of the right ventricle. Changes occur in the blood. Often there develops a high red count and a high content of hemoglobin. Interference with the normal oxygenation of the blood within the finer vessels in the lungs is primary. The vessels are diminished in number and the air passages contain a lower content of oxygen. Congestive cardiac failure superimposed in a later stage adds the factor of excessive utilization of oxygen. The prolonged circulation time associated with cardiac failure provides opportunity for excessive utilization of oxygen by the tissues.

There is an increased air content in the lungs in this con-

dition, but the air is to a considerable extent static. The exchange of gases is permanently, and in the later stages fatally, impaired. It is possible that in a large number of these cases the principal factor is a primary weakness of the elastic elements of the lung. As a result of inflammatory processes affecting the finer passages, the septa of the alveoli disappear. The increase in the volume of the lung is not associated with an increased capacity for the exchange of gases. Actually the site of such an exchange is diminished. Inspiration is carried on with effort; expiration is not adequate; the expiratory phase is usually obstructed by narrowing of the bronchi. The normal ventilation of the alveoli is impaired, even though the lung is much more voluminous than usual. The result is failure normally to rid the pulmonary air of carbon dioxide and provide a normal concentration of oxygen.

As Meakins and Christie have stated: "Chronic pulmonary emphysema is a permanent overdistention of the alveoli and a decreased elasticity of the pulmonary tissues . . . As this loss of elasticity progresses, the lungs can no longer resist the traction of the chest wall and they distend until a position approaching full inspiration is reached. The lung can now no longer deflate during expiration by the normal process of passive elastic recoil but has to be actively compressed by the extrinsic muscles of expiration. In other words, the lung has to be pulled on to make it distend and then has to be actually squeezed to make it deflate. This is a highly unnatural form of respiration and one that leads to general disruption of the mechanics of pulmonary ventilation and circulation."

Owing to the widespread obliteration of the capillaries in the alveolar walls, a serious intrapulmonary resistance to the circulation within the lung is established. Obviously, the diminution of the capillary bed in the pulmonary circuit imposes an increased burden upon the right heart. Often right ventricular hypertrophy occurs. Eventually dilatation and right ventricular failure develop. The heart is of the mid-thoracic type, and may appear small, especially prior to the occurrence of cardiac failure. The increased pulmonary volume is probably responsible for these cardiac effects. As the emphysematous process proceeds, cyanosis deepens. Eventually a right ventricular failure is obvious. The "emphysema"

heart is characterized by the development of dyspnea, cyanosis and passive congestion, usually in an older person who has a chronic bronchitis with emphysema. Auricular fibrillation is common. The heart is not often much enlarged, because the strain of the process involved is thrown entirely upon the right ventricle. General hypertension is not common in the course of emphysema.

In my experience the onset of congestive failure has been ominous; rarely do these patients regain compensation to the point of returning to work. With the development of decompensation, the course thereafter is likely to be a series of episodes of improvement alternating with congestive failure upon small provocation. It has also been our experience that congestive failure in individuals with emphysema is usually associated with arteriosclerosis. Both are more common in men who have done manual labor. Emphysema is often found in men whose occupations are not particularly heavy but which are associated with exposure to abrupt changes in temperature and to dust and smoke.

The *treatment of cardiac failure* in the course of emphysema is that of congestive failure in general. Response to treatment with rest and digitalis is often slow. Compensation may be restored, but these patients seem to have little margin of safety. Though decompensation may appear to be under control, improvement is not so satisfactory as we expect in other types of congestive failure. In cases of emphysema with cardiac failure, the dyspnea does not disappear with effective doses of digitalis; the heart may respond but the patient has not been relieved of his primary disease, emphysema. It has been our experience that the patient of this type soon sustains a recurrence of congestive failure. Moderate restoration of compensation alternating with failure marks the course of these patients once the emphysema is complicated by cardiac failure and the prognosis for life is not good.

The *treatment of the emphysema* is symptomatic. We have no remedy which will promote restoration of normal function. Treatment is directed to the amelioration of symptoms and to the prevention of progress of the disease. Once the disease is established, it is irreversible. In those instances in which allergic asthma has been responsible for emphysema, control

of the asthma may ameliorate the symptoms, but the emphysema will not be succeeded by normal pulmonary structure. Even under favorable circumstances an emphysema once begun is likely to be slowly progressive. This has some bearing upon the view of many physicians that, etiologically, emphysema is a primary deficiency of the elasticity of the pulmonary tissues.

In the treatment the first requisite is to remove the patient from exposure to causative factors. *Climatic treatment* early in the course of a chronic bronchitis is important. The chronic bronchitis so often the cause of emphysema may be alleviated by residence in a warm dry climate. Occupational factors are of importance; change of occupation is indicated early in the course of chronic bronchitis if the occupation may reasonably be regarded as a contributory cause. Such occupations include all associated with exposure to dust and abrupt changes of temperature, and conditions which promote frequent upper respiratory infections.

Some excellent methods of therapeutic procedures for emphysema have been presented in recent years. Meakins and Christie state that "The anatomic state of the emphysematous lung is beyond repair. Its treatment, therefore, is restricted to the amelioration of the resulting functional defects. . . . The difficulties of expiration and the paradoxical movement of the diaphragm can best be relieved by increasing the intra-abdominal pressure through the wearing of a tight abdominal binder. . . ." When necessary, "temporary relief can be obtained by the inhalation of air enriched by oxygen." Sleep can be promoted by the use of oxygen for an hour before going to bed. "In the acute attacks, free venesection should be done promptly."

Burgess Gordon suggests that "certain unfavorable results observed in the standard treatment of pulmonary diseases are due to inefficient diaphragm action," and states that "It has been observed in certain patients that elevating and limiting diaphragm excursions by means of special abdominal supports facilitates expectoration, decreases cough and dyspnea, and influences most favorably the general condition."

Alexander and Kountz describe a similar procedure: "In

advanced obstructive emphysema, difficulty in breathing is due principally to mechanical factors. The large lungs hold the diaphragm in the position of inspiration, and indirectly they also distend the chest to a barrel shape. . . . It has been found that the diaphragm can be pushed upward toward its expiratory position by means of abdominal pressure properly applied."

Barach reports that Campbell and Poulton treated patients with chronic bronchitis and emphysema in 1927 with marked improvement. Forty per cent oxygen was used. Richards and Barach have also used oxygen for the relief of these conditions. The therapy has been employed for long periods with encouraging results. The clinical improvement has been marked; various tests of respiratory function have shown increased efficiency of the respiratory mechanism. They state that the results in these cases, with several differences, may be compared with those obtained in patients with chronic congestive heart failure.

Chronic Bronchitis.—Chronic bronchitis includes a motley group of diseases of the bronchi, in great part associated with pulmonary diseases of a chronic character which involve the bronchi and the finer parts of the lung. It implies an inflammatory process, not only of the mucous membrane, but of the wall. The mucous membrane may undergo hypertrophic or atrophic change. The changes in the bronchial wall include fibrosis, with destruction of the musculature and even of the cartilage. There may be an extensive fibrous replacement.

Chronic bronchitis is usually the result of frequently recurring respiratory infections. As the disease recurs and the patient grows older, the symptoms are aggravated. More serious types of the disease develop: purulent or putrid bronchitis, often associated with dilatation of the bronchi, chronic bronchiectasis. Emphysema may be a complication.

Some authors maintain that the early process in the development of emphysema, distention of alveoli, is partly due to the narrowing of the finer bronchi in the course of the bronchitis. Vigorous inspiratory efforts will fill the finer portions of the lung, but the more passive expiration fails to empty the same spaces. Chronic infiltrative processes—tuberculosis, sili-

cosis and anthracosis—are eventually associated with some degree of chronic bronchitis. Many people who have frequent attacks of acute bronchitis winter after winter develop a chronic bronchitis which is associated with much secretion and bronchial dilatation. The "cap sheaf" of such processes may be bronchial dilatation or emphysema. Stricture of a larger respiratory passage, pressure of a tumor or aneurysm, or contraction following upon a localized empyema may be responsible for a localized chronic bronchitis with all the possible sequelae of the same. Bronchial syphilis may occur, with irritative symptoms followed by ulcerating or sclerosing processes. This occurs only in the tertiary stage. The diagnosis is not easy, and in such cases should be supported by a positive serologic test. Such lesions are rare and must be diagnosed only after careful study.

In the purely infective types, the incidence of the disease is much less in warm, dry climates and its progress is slower. The annual variations in the course of the bronchitis are well recognized. As the patient grows older, the cough is more persistent and severe; the symptoms are aggravated as the signs of bronchial dilatation appear; purulent bronchitis with much sputum, occasional exacerbations of fever, early signs of cardiac disease as a result of respiratory infections or arteriosclerosis, chronic pulmonary changes, and advancing years, combine to produce a distressing and often incapacitating situation. Dyspnea and cyanosis are indicators of the extent of the disease. Chronic bronchial disease may become fetid; the odor adds to the distress of the patient and those who care for him. In every calling in which workers are exposed to dust this disease is common. Miners, quarry workers, street cleaners, workers in wool or cotton, those exposed to dust of any kind, and those exposed to sudden changes of temperatures, are especially prone to chronic bronchitis and its sequelae.

It should be emphasized that the diagnosis of "chronic bronchitis" must not be accepted in this simple form without excluding certain other types of infection and pathologic conditions within the lung, such as chronic pneumonia, stricture of a larger air passage with pulmonary involvement or pul-

monary tumor of any type. Tuberculosis must be excluded. It should also be borne in mind that, occasionally, congestive heart failure is accepted for a time as "bronchitis."

There is no specific therapy for chronic bronchitis. The underlying cause is to be sought and appropriate treatment applied. The use of drugs is palliative. Protection from dust, exposure to cold weather, and sudden changes of weather is important. Residence in a suitable climate throughout the year is especially helpful.

Drug therapy is not specific; remedies in use include inhalations of various drugs, expectorants in certain stages, remedies to restrain cough in practically all cases. Potassium iodide has been widely used to promote and thin secretion. Ammonium chloride, Dover's powder, and preparations of squill are some of the drugs in use. Opiates should be used with care and only for temporary indications. The inhalation of vapors, such as eucalyptol and menthol, may be employed. These procedures are palliative, not curative; the progress of the disease can be stayed only by the opportunity to escape the irritant which provokes the disease; otherwise, the disease progresses.

The prognosis is not good for those patients who must live throughout the year in the temperate zone; it is made worse by the necessity of the patient to continue work in an occupation which is prone to aggravate his disease. The course and sequelae of asthmatic bronchitis are similar to those of the types of bronchitis discussed, but it is not within the scope of this paper to discuss asthma.

Pneumonia.—All of us are acquainted with the oft-quoted dictum of Osler, "Pneumonia may well be called the friend of the aged." Taken off by pneumonia in an acute, short, and relatively painless illness, the old escape those "cold gradations of decay" that so often make the last days of life a burden. Though modern methods of treatment have achieved a remarkable decrease in the mortality of pneumonia, the "pneumonia of the aged" continues to show a death-rate much out of proportion to the reduction in mortality in the whole group of pneumonias.

Bullowa states that "the mortality is greatest in infants and in adults after the age of fifty." So-called "terminal pneu-

monia" should not be confused with pneumonia of aged people. Terminal pneumonia is characterized by the presence of an insidious pneumonia in the course of another disease which has kept the patient bedfast for a considerable period of time. The discovery of the pulmonary disease is often delayed until an autopsy is made. "Pneumonia of the aged" refers to the usual or variant types of this disease which run a short course, often aberrant in character. The pneumonia is recognized at the bedside and usually presents a typical infection, but the symptoms often come on insidiously, the physical findings are equivocal at first, and the development of the disease is less abrupt than is usual in younger people. Marked depression not easily accounted for often sets in almost from the start. The older the patient the more dangerous is the pneumonia. Coope, Osborn and Pygott concluded that "Age brings an added load on renal, hepatic and cardiovascular function. A positive blood culture at any age is serious, but in older patients it is ominous." Influenza or like infections in old people are especially prone to develop into a fatal pneumonia.

The onset is rarely abrupt; rather does it come on "as a thief in the night"; even a minor cold or upper respiratory infection may be followed by symptoms of prostration. Frequently the physical findings appear only after a period of unexplained illness, perhaps through three or four days; without chills and without rusty sputum, a marked increase of temperature, and definite leukocytosis or definite findings in the lung, the diagnosis of pneumonia is made only with difficulty. Often the patient is near death before the diagnosis of pneumonia is made. The *x*-ray is valuable in diagnosis.

This group of pneumonias often do not present typical pneumococci, hence the use of serum may not be indicated. When pneumonia is suspected, however, typing should be done and serum used if the infection is demonstrated as one of specific types and amenable to serum therapy.

Non-tuberculous chronic pneumonia may be the end stage of pneumonia in the aged. Usually this develops from atypical pneumonia, such as occurs as a complication of influenza or nonspecific upper respiratory infection. Götte emphasizes that in these older patients thoracic deformity apparently produces a disposition to the chronicity of pneumonia. The inclination

to recurrent bronchopneumonia is especially marked in chronic cardiac congestive processes in the lung. This occurs also in the presence of emphysema, chronic bronchitis and bronchiectasis.

In *summary of the treatment of pneumonia* in the aged it may be said that the following measures should be employed:

1. Serum treatment early, if typing of the sputum reveals a type amenable to specific treatment.

2. Oxygen.

3. Supportive treatment: adequate food and fluid; intravenous use of glucose, saline, or Ringer's solution; provision for sleep.

4. Such drugs as caffeine, strychnine and coramine may be used. Their value has not been determined, though all have been extensively used. Digitalis should be tried, especially in the presence of congestive failure. The possibility of congestive failure in these older people as a factor in the course of pneumonia should always be kept in mind. Not infrequently the response to digitalis indicates that the pulmonary condition was primarily a manifestation of cardiac failure.

5. Measures to control cough and pain.

6. Sulfanilamide and its congeners, with due regard to the toxicity of these drugs, the occasional occurrence of idiosyncrasy in patients, and the varying degree to which different species of bacteria are affected by the use of the members of this group.

7. Sedatives may be necessary; but these should be employed with especial caution in older patients.

8. Abdominal distention may require treatment; the milder types of cathartics and enemata are preferable for these older people. A rectal tube may relieve the distention.

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Medical Clinics of North America
January, 1940. Chicago Number

CLINIC OF DRS. ALLAN J. HRUBY
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MUNICIPAL TUBERCULOSIS SANITARIUM

DIAGNOSIS AND TREATMENT OF TUBERCULOSIS IN THE AGED

TUBERCULOSIS in the aged is far more common than is ordinarily believed. The reasons are obvious. In the aged we encounter many atypical findings which, although really caused by tuberculosis, are masked by non-tuberculous processes and associated diseases such as asthma, chronic bronchitis, bronchiectasis, heart conditions, malignancy, abscesses, emphysema and others.

The theory was prevalent that tuberculosis and asthma are rarely associated, that patients with asthma rarely develop tuberculosis, and that, in fact, the two diseases are antagonistic to each other. Fishberg, for instance, quotes Brugelmann as saying that "as long as one has asthma, he is immune to tuberculosis," and West states that "phthisical patients very rarely suffer from spasmodic asthma, and if an asthmatic patient becomes phthisical, an event which is by no means common, the asthma usually disappears." Of late, however, this theory is being disproved; the fact of the frequent association of asthma with pulmonary tuberculosis is being more generally recognized.

The history obtained from an aged person is usually more or less vague as to contact with tuberculous people in early life. The obverse of the picture is sharp and well-defined: Contact of elderly tuberculous patients with young people, children, and grandchildren particularly, is quite common. The economic and public health meaning of such contact needs little mention; it is an old story that practitioners, dispensary clinicians and public health workers are only too familiar with. Most of us have seen the aged consumptive who, after having

destroyed his entire family in all innocence, goes on living and broadcasting his infection perhaps to new victims in whatever new milieu he finds himself after his family life has been disrupted.

For this reason, in view of the preventive significance, *pulmonary tuberculosis in the aged should never be overlooked.* It need not be overlooked if one considers the five points given by Lawrason Brown, in Tice's "Practice of Medicine," in which the clinician will be in error in only 2 per cent of cases if any two or more of these symptoms are found, namely:

Symptoms of Tuberculosis in the Aged

1. Hemoptysis of a drachm or more.
2. Pleurisy with effusion.
3. Persistent, moderately coarse râles above the third rib and third vertebral spine.
4. A parenchymatous lesion upon the film in the same area.
5. The presence of tubercle bacilli in the sputum.

It is necessary to remember that a persistently negative sputum does not eliminate tuberculosis. Chronic fibroid tuberculosis of many years' standing, negative to ordinary smears, is often found positive on culture and animal inoculation. The same is true in gastric lavage, which is frequently revealing where other tests fail. The *x*-ray, too, is of great value in the diagnosis and differential diagnosis of chronic fibroid tuberculosis, the type usually found in the aged.

During the past ten years, from April, 1929 to April, 1939, 550 patients of the age of fifty or more have been admitted to the Municipal Tuberculosis Sanitarium with a diagnosis of pulmonary tuberculosis or suspected tuberculosis made before admission. Only fifty of these cases were found to be non-tuberculous. Associated diseases in addition to the tuberculosis were found in 220 of these cases: cardiac disorders in ninety-two cases, diabetes in thirty-eight; chronic bronchitis in twenty-six; asthma in twenty-four; cancer in fifteen; nephritis in thirteen; and bronchiectasis in twelve.

ILLUSTRATIVE CASES

Case I.—A. J., sixty years of age, was admitted to the Municipal Tuberculosis Sanitarium on December 21, 1937, complaining of cough, expectoration, and streaked sputum a

few weeks before. He had had asthma for the past two or three years, had lost weight from 145 pounds to 97 pounds, and had some pain in both sides of his chest. For eighteen years previous to his illness, this patient had been in the grocery business. Prior to that he had been a laborer for the Wisconsin Steel Company, where he did *grinding of metal tools* and also cement mixing.

The patient was originally registered at the Grand Crossing Dispensary in 1918 with a moderately advanced case of pulmonary tuberculosis and was dismissed as an apparently arrested case in 1926. He returned to the clinic in 1935 complaining of cough and asthma for six months. At that

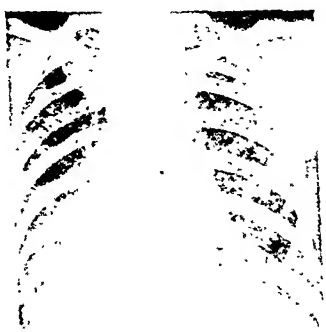

Fig. 1.—Case I. 12/21/37.

Fig. 2.—Case II. 3/10/32.

time numerous râles were heard on both sides. Two sputum specimens out of three were found positive and a diagnosis of far advanced tuberculosis was made. However, x-ray studies made in August, 1935, failed to substantiate the diagnosis of tuberculosis. The patient was in Arizona most of the time from August, 1935 until June, 1937, with a severe cough and dyspnea.

Physical examination revealed a thin chest; clavicular spaces retracted bilaterally; dullness on both sides; many râles throughout both sides, and some wheezing on both sides. The blood pressure was 100/70. Cardiac dullness was essentially normal; sounds were regular and no murmurs were heard. The electrocardiogram showed evidence of auricular

hypertrophy and auricular premature contractions. The *x*-ray of the chest (Fig. 1) showed marked infiltration of the larger part of the right lung fields, characteristic of a well-advanced tuberculosis.

Laboratory findings revealed a negative sputum; the urine was also negative. The blood count was: red cells, 4,280,000, and white cells, 10,000; hemoglobin was 74 per cent. A differential count revealed: neutrophils 74 per cent, basophils 1 per cent, small lmyphocytes 5 per cent, large lymphocytes 12 per cent, and monocytes 8 per cent; the Schilling index was stab cells 10 per cent, and segmented 64 per cent. The sedimentation rate was *15 min. 3.5 mm.; 30 min. 17 mm.* Wassermann and Kahn tests were negative; the Mantoux test was positive.

A diagnosis of pulmonary tuberculosis, far advanced B, was made on February 17, 1938, with asthmatic bronchitis and silicosis, based on sputum findings of silica 1.63 mg. per Gm. of sputum.

The patient was put on routine Sanitarium care and given symptomatic palliative treatment. Codeine was given twice daily for relief of the cough, which was quite severe and persistent. Ephedrine was administered for relief of the asthmatic attacks. He was discharged on his own request (January 13, 1938) not improved.

Case II.—G. F. M., sixty years of age, a lawyer, was admitted to the Municipal Tuberculosis Sanitarium on March 9, 1932, complaining of tiredness; loss of weight, amounting to 26 pounds in the past six months; cough for the past six months; expectoration for past two weeks only; pain in the chest; fever for two weeks (high 103° F.) and chills and night sweats in February. He had been confined to bed since February 11, 1932. The patient gave a history of having had typhoid at the age of nineteen; a syphilitic infection at thirty-nine, for which he received no treatment; and rheumatism in the right arm for the past year and a half.

On physical examination the chest was found to be emaciated, with marked retraction on the right side above and below the clavicle and above the scapula posteriorly, and definite lagging. On percussion we found dullness over the entire right

side, more in the upper half, and impaired resonance on the left.

Auscultation revealed on the right diminished breath sounds, increased whispered voice and prolonged expiration. There were many moist râles in the upper two-thirds of the right chest. On the left we found diminished breath sounds in apex, roughened inspiration, no râles. In a small area just below the left clavicle there was amphoric breathing—findings suspicious of cavities.

The *x*-ray (Fig. 2) taken on March 10, 1932 showed marked haziness on the upper right, extending toward the base.

Fig. 3.—Case II. 4/25/33.

Fig. 4.—Case II. 6/9/34.

There was evidence of cavitation in the apex. The left was negative.

Examination of the blood showed a red count of 4,480,000, a white count of 10,000, and hemoglobin 74 per cent. Neutrophils were 73 per cent, eosinophils 1.5 per cent, basophils 1 per cent, transitional cells 10 per cent, small lymphocytes 4 per cent, large lymphocytes 10 per cent, and large monocytes 0.5 per cent. The Wassermann and Kahn were 4 plus on repeated tests.

A diagnosis was made of pulmonary tuberculosis, far advanced, and syphilis. Pneumothorax on the right was recommended and antisyphilitic treatment by bismocymal.

Pneumothorax was started and a successful collapse was

obtained with the exception of a band of adhesions holding out a large cavity. An *x*-ray (Fig. 3), taken April 25, 1933, showed pneumothorax on the right and a band of adhesions. The left was negative.

After about ten months of pneumothorax treatment it was decided to cut these adhesions; an open intrapleural pneumolysis was successfully done in May, 1933, and pneumothorax was continued. Fluid developed; at first it was bloody, then after aspirations and irrigations at short intervals it became yellowish and purulent, and was positive for tuberculosis on culture in June, 1934. Olive oil was injected into the pleural cavity at three- or four-day intervals (25 to 50 cc.) and air was removed. An *x*-ray (Fig. 4), taken on June 9, 1934 showed a satisfactory collapse and a fluid level following pneumolysis. Oleothorax had been instituted.

The empyema cleared up and the wound, which at first was slow healing and left a fistula, healed. Sputum became negative for tuberculosis four months after the operation and remained negative. The patient gained 20 pounds in weight.

Two courses of twelve injections of bismocymal (2 cc. each) were given from March, 1932 to July, 1932. The Wassermann and Kahn showed a 1 plus reaction. The patient was discharged on his own request in July, 1934, an apparently arrested case. He has been well and is back at his previous work as a lawyer.

Case III.—G. I., aged sixty, was admitted to the Municipal Tuberculosis Sanitarium, May 6, 1929, complaining of a chronic productive cough for about a year. About seven months before he noticed a loss of weight of about fifteen pounds in four months. He consulted his physician and was sent to St. Luke's Hospital for observation. A diagnosis of tuberculosis was made. He went to the County Hospital and, while there, he spat up blood-flecked sputum on two or three occasions and had night sweats.

The patient was single. His mother had died from tuberculosis when he was six years old, and he had lived with his sister for the past twenty-six years. This sister had two children. One had died from tuberculosis five years before at the age of twenty-four. The patient said that he had had

typhoid pneumonia at the age of fifteen and the diseases of childhood. He had been employed for forty-one years as a clerk in a department store and had worked steadily.

On physical examination the patient was not acutely ill but was slightly cyanotic. The chest was somewhat barrel-shaped, the ribs fairly prominent, and the apices not retracted. Tactile fremitus was increased and there was dullness on the upper half of the left side. There were a few râles on the right side in the upper part of the lung; on the left, breath sounds were harsh and suppressed throughout and râles were heard from apex to base. There was no evidence of fluid or cavitation.

Fig. 5.—Case III. 5/8/29.

Fig. 6.—Case III. 1/9/31.

The cardiac sounds were clear; there were no murmurs. The blood pressure was 118/74.

The *x*-ray (Fig. 5), taken on May 8, 1929, showed extensive involvement of the entire left lung of a fibro-ulcerative type of tuberculosis and evidence of multiple cavities. On the right side was an area of infiltration in the mid-lung field extending out from the hilum.

Laboratory tests revealed a positive sputum; the urine was negative. Red cells numbered 4,690,000, and white cells 8,800; the hemoglobin was 60 per cent. The Wassermann and Kahn reactions were negative.

A diagnosis of far advanced pulmonary tuberculosis was made and the patient was put on routine Sanitarium care. He

improved on a regimen of rest and gained about 10 pounds in a year. His temperature was normal; the pulse fluctuated between 72 and 100. The sputum became negative in April, 1930, and remained negative.

However, because of what appeared to be persistent activity in the left lung, phrenico-exairesis was performed in September, 1930. The result was a marked rise of the left diaphragm and clearing of the diseased process of the left lung, and the patient continued to gain weight. An *x*-ray (Fig. 6), taken January 9, 1931, four months after phrenico-exairesis, showed a rise of the left diaphragm and a marked clearing of

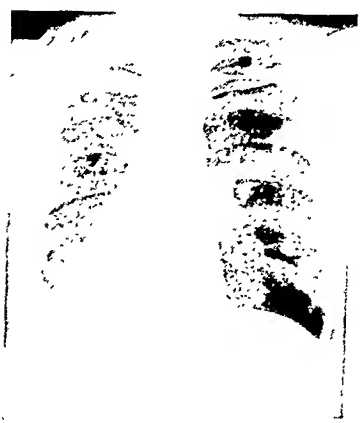

Fig. 7.—Case III. 10/20/31.

Fig. 8.—Case III. 6/16/32.

the left lung. The right lung also showed clearing of the exudative process.

About this time a glandular swelling appeared on the left side of the neck. *x*-Ray treatment was given but this swelling did not respond. It became hard and fixed. Biopsy on December 29, 1930 showed metastatic squamous-cell carcinoma. At this time the tumor was the size of a lemon. The tumor was excised and deep *x*-ray therapy was given to the neck and supraclavicular space.

The incision on the left side of the neck healed. The physical findings over the chest at this time were impaired resonance at the base and upper right lung with fine râles at the

base and signs of cavitation in the upper lung. There were crepitant râles posteriorly. From this time on, the physical findings in the chest became more definite: harsh and roughened breathing throughout, characteristic of consolidation. In spite of this, however, the sputum remained negative.

An *x*-ray (Fig. 7), taken on October 20, 1931, revealed areas of concrete density scattered throughout both parenchymal fields which denoted old tuberculous activity, probably quiescent at this time.

At this time a nodule appeared in the center of the scar above the wound on the neck; this slowly increased in size to about 6 cm. in diameter and bled readily. *x*-Ray therapy was continued. Examination of the larynx showed marked infiltration of vocal cords but no ulceration. Examination of the prostate gland was negative except for hardening on the left side. *x*-Ray examination of the gastro-intestinal tract was negative; that of the long bones, including the spine, showed no evidence of destruction.

A diagnosis was made at this time of bronchogenic carcinoma of the right lung, with possible metastasis to the neck. The patient died in September, 1932. Fig. 8, taken on June 16, 1932, shows the extensive involvement of the malignant process.

Autopsy revealed: healed bilateral pulmonary tuberculosis; nodular and ulcerative primary bronchogenic carcinoma in the right main bronchus with metastases to other parts of the lung; bilateral, obliterative fibrous pleuritis; metastatic carcinoma of the liver; arteriosclerosis of the kidneys; parenchymatous degenerations of the myocardium; arteriosclerosis of the aorta and coronaries; acute splenic tumor; diminished lipoid content of the adrenal glands; marked secondary anemia; carcinomatous ulceration of the skin of the left side of the neck; focal hyperplasia of the prostate gland.

Case IV.—M. C., age sixty-seven years, was admitted to the Municipal Tuberculosis Sanitarium, September 16, 1932, complaining of cough and blood-streaked sputum. This came on with a cold in February, 1932. He had lost 62 pounds since February, was tired, had a heavy feeling in the front of his chest, and was dyspneic on slight exertion. He had been a

heavy drinker. He had worked as a teamster, had been with the Police Department, and had had a number of odd jobs. He quit work in October, 1931. The patient was a widower; his wife had died from cancer at the age of fifty-eight.

Examination on admission showed a typical emphysematous barrel-shaped chest with right upper hyperresonance and left, markedly impaired resonance with a few sibilant rhonchi.

An *x*-ray (Fig. 9), taken September 16, 1932 revealed marked density over the entire left lung with an area of softening below the clavicle suggestive of cavitation. The cardiac shadow was entirely lost in the arc of haziness. The right lung was negative.

Fig. 9.—Case IV. 9/16/32.

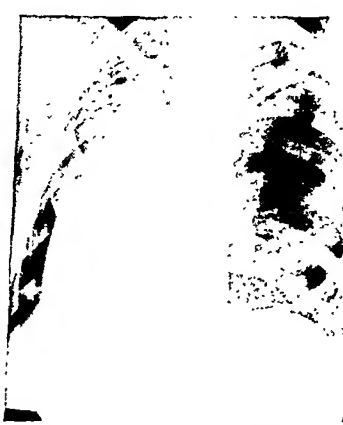

Fig. 10.—Case IV. 9/29/32.

Laboratory tests revealed a negative sputum. Red cells numbered 3,390,000 and white cells 16,000; the hemoglobin was 60 per cent. A differential blood count showed: neutrophils 89.5 per cent, transitional cells 4 per cent, small lymphocytes 2 per cent, large lymphocytes 3.5 per cent, and monocytes 1 per cent. Wassermann and Kahn tests were negative. The urine was also negative. A Mosenthal kidney function test showed poor function. The Genito-urinary Department to which the patient was referred reported a negative atrophic prostate with no evidence of carcinoma.

A diagnosis of questionable pulmonary tuberculosis was made with a suspected malignancy of the left lung. A recom-

mendation was made for further examination and routine Sanitarium care.

Constipation was relieved by oil enemas and cathartics. Pain in the chest required morphine. Pneumothorax on the left side was attempted September, 1932, 700 cc. of air being injected for diagnostic purposes.

An x-ray (Fig. 10), taken on September 29, 1932, following pneumothorax, showed a free but atelectatic lung with no frank evidence of cavitation.

Because of the patient's general condition, and the marked asthma, severe cough requiring codeine, the persistently negative but blood-streaked sputum, marked anemia, and the x-ray findings, a diagnosis of malignancy of the left lung was made. The patient died in April, 1933.

Autopsy revealed: a bronchogenic carcinoma of the left lung; obstruction bronchiectasis with miliary abscesses of the left lung; bronchopneumonia of the right lung; obliterative fibrous pleuritis of the left lung; focal fibrous pleuritis about the right upper lobe; barrel-shaped deformity of the chest; chronic hypertrophic pulmonary osteoarthropathy; atheromatosis of the aorta; marked emaciation; moderate anthracosis; and metastatic invasion of the cellular mediastinal tissue.

Case V.—W. B., aged seventy-five, a Jail Officer, was admitted to the Municipal Tuberculosis Sanitarium March 26, 1935, complaining of shortness of breath for about five months; loss of 48 pounds since May, 1934; tiredness; occasional fever; very little cough, expectoration of about ½ ounce daily; no hemoptysis; and diabetes for the past fifteen years.

The patient said that he had felt well until about a year previously, in February, 1934, when he began to notice tiredness. In April he felt more tired and weak. He stopped work about a month later. He began to raise more sputum and lost weight. He spent the summer in the country and felt fairly well, but became short of breath. In January, 1935, he was admitted to the Mercy Hospital as he said for a check-up. An x-ray revealed tuberculosis and sputum was found positive. He was advised to go to the Municipal Tuberculosis Sanitarium.

Physical examination revealed the patient to be emaciated

and very weak. The clavicular spaces were retracted bilaterally and there was bilateral impaired resonance. On auscultation: breath sounds were diminished; whispered voice increased at apex; a few râles throughout on the right side, heard near the apex, and diminished breath sounds on the left. The cardiac sounds were regular; there were no murmurs. The blood pressure was 100/60.

An *x*-ray (Fig. 11), taken on March 27, 1935, showed both apices hazy; diaphragms regular; costophrenic angle on the right clear; left not shown. The cardiac shadow was displaced to the right. The area of supercardiac dullness was increased

Fig. 11.—Case V. 3/27/35.

Fig. 12.—Case V. 8/29/36.

and the descending aorta showed very prominently. Both upper fields showed an old infiltration of tuberculosis.

Laboratory tests revealed a positive sputum. The urine contained albumin, 100 mg. per L. The blood sugar was 225 mg. per 100 cc. The red blood count was 5,100,000, the white count 8,100; hemoglobin was 73 per cent. A differential count showed neutrophils 70 per cent, eosinophils 2 per cent, basophils 1 per cent, small lymphocytes 10 per cent, large lymphocytes 10 per cent, and monocytes 6 per cent. The Schilling index was: stab cells 30 per cent, segmented cells 40 per cent. The sedimentation rate was 15 min. 4.5 mm.; 30 min. 15.5 mm. The Wassermann and Kahn reactions were negative.

A diagnosis was made of pulmonary tuberculosis, far advanced B.; diabetes mellitus and pleural effusion. Routine Sanitarium care and diabetic management were recommended.

The patient was kept on a routine and did well. His temperature fluctuated slightly between 97 and 100° F., and the pulse between 70 and 90. He gained 45 pounds in the course of one year. His blood pressure rose to 164/80. The pulmonary condition apparently remained unchanged. Sputum was persistently positive and the amount of 50 to 70 Gm. in twenty-four hours persisted. We recommended the same routine care and diabetic management.

Diabetic management: Blood sugar (4/16/35): 170. Urine sugar (3/27/35): 500 cc. contents, 5.5 gm. Diet: 2000 standard C 206, P 60, F 103. Insulin: A. M. 10 units, P. M. 6 units. With a slight variation the patient was kept on the same diet. Insulin doses were changed from time to time.

The blood pressure was 164/80. At this time the patient had what appeared to be a stroke, shown by drooping of the left eyelid. His face was drawn toward the right side and he complained of pressure in the left side of his head. There was no paralysis of the extremities. Shortly after this condition developed, the patient began to vomit frequently in the morning and lost weight. About four months later these symptoms disappeared entirely and the patient felt quite well, but he had lost 10 pounds. One month later (September, 1936), dullness developed on the lower left side, fluid was present, and with it there was a rise in temperature, dyspnea and edema of extremities.

An x-ray (Fig. 12), was taken August 29, 1936. One thousand cubic centimeters of fluid was removed from the chest. It was cultured and found negative for tuberculosis. The patient showed a steady decline and expired on October 29, 1936.

Autopsy revealed: fibro-ulcerative tuberculosis of the right upper lobe; primary complex in the right hilum lymph nodes; fibrous obliteration of the upper portions of both pleural cavities; left serofibrinous pleuritis; old tuberculous ulceration of the cecum and appendix; severe atheromatosis of the aorta; slight atheromatosis of the coronary arteries; chronic passive congestion of the liver, spleen and kidneys; chronic cholecys-

titis and cholelithiasis; diabetes mellitus; marked prostatic hypertrophy; and calcium infarcts of the renal papillae.

Case VI.—D. H., aged, sixty-seven, a commercial artist, was admitted to the Municipal Tuberculosis Sanitarium on December 16, 1936, complaining of a cough which he had had during most of his life; slight expectoration; occasional fever of 100° F.; shortness of breath, marked on exertion; tiredness for the past six months; and loss of weight, from 248 pounds to 144 pounds in the past five years.

The patient stated that his wife had died of tuberculosis in 1935 at the age of forty-nine. One daughter had died in January, 1936, aged twenty-seven, from tuberculosis, and one daughter was ill with tuberculosis at Naperville Sanatorium. Because the patient had become unusually tired in June, 1935, and because of his knowledge of tuberculosis, he decided to have an *x*-ray taken of his chest. This showed pulmonary tuberculosis. He went to Naperville Sanatorium where sputum was found positive and pneumothorax was started on the left side and continued to this time. He left the Sanatorium in February. In July he developed a pleural exudate and had only a few refills after that. He thought he had improved but was shorter of breath than ever. He stated he had had diabetes for ten years and had been getting 15 units of insulin every morning.

Physical examination revealed the chest to be well filled out; there was some lagging on the left. Percussion revealed some impairment of resonance in the left apex. The breath sounds on the right side were normal and on the left side were subdued to absent. A few râles were present in both apices. He weighed 163 pounds. The blood pressure was 140/70.

An *x*-ray (Fig. 13), taken on October 16, 1936, revealed: apices hazy; left diaphragm rather oblique; costophrenic angle clear. The right diaphragm was higher than normal and the costophrenic angle showed a pneumothorax. There was a marked fibrous band of adhesions at the left apex. On the right side there was fenestration of one of the lower ribs.

Laboratory reports showed a positive sputum for tuberculosis. Red cells numbered 4,450,000 and white cells 10,500 per cu. mm.; the hemoglobin was 68 per cent. A differential

count showed neutrophils 63 per cent, eosinophils 4 per cent, basophils 1 per cent, small lymphocytes 15 per cent, large lymphocytes 17 per cent, and monocytes 5 per cent; the Shilling index was stab cells 11 per cent, and segmented cells 52 per cent. The sedimentation rate was: 15 min., 1.5 mm.; 30 min., 10 mm.

The Wassermann and Kahn reactions were negative. The blood sugar was 160 mg. per 100 cc. The urine was negative and contained no sugar or albumin.

A diagnosis of far advanced pulmonary tuberculosis and diabetes mellitus was made. Continuance of pneumothorax on the left was recommended and diabetic management. The

Fig. 13.—Case VI. 10/16/36.

Fig. 14.—Case VI. 1/21/38.

pneumothorax was continued at two- to four-week intervals, only small amounts of air being given.

An *x*-ray (Fig. 14), taken on January 21, 1938, showed collapse of the lower part of the left lung; the upper part was adherent.

A standard diabetic diet was given, consisting of: 2000 cals, C 206, P 60, and F 103 gm. Insulin (15 units daily in the morning) was given. After five weeks the blood sugar dropped to 69 mg. per 100 cc. and insulin was reduced to 10 units. After another ten days the insulin was discontinued and the diet reduced to 1800 cals, C 186, P 50, and F 93. The blood sugar fluctuated between 143 and 161 mg. Ten units of insulin

was given again and the diet increased as before to 2000 calories. The patient was doing well and his condition was well under control.

Because of the patient's complaint of substernal pains, an electrocardiogram was taken on October 20, 1937; this showed evidence of myocarditis and coronary sclerosis. However, the patient's general condition remained unchanged. He was apparently doing well and was up and about. On January 28, 1938, he was given permission to go out to visit some friends and, on returning to the Sanitarium, he was walking through the tunnel when he collapsed. He was dead before he could be brought back to bed.

An autopsy was permitted, which revealed: marked arteriosclerotic occlusion of the descending branch of the left coronary artery; focal myocardial and endocardial sclerosis; arteriosclerosis of the left circumflex branch and of the right coronary artery; focal myocardial and endocardial sclerosis; arterithrombi in the abdominal portion; marked passive congestion of the liver, spleen and kidneys; diabetes mellitus; left pneumothorax; diffuse fibrous adhesions about the left apex; left fibrinous pleuritis; focal fibrous right apical adhesions; prostatic hypertrophy; surgical absence of the ocular lenses with iridectomy colobomata; umbilical hernia with omental adhesions; chronic cholecystitis with cholelithiasis; fibro-ulcerative nodose and pneumonic tuberculosis of the left lung and primary tuberculous complex.

COMMENT

The cases presented show, we believe, that the associated pathology incident to age makes diagnosis extremely difficult. Without the *x*-ray and the positive sputum, the clinician cannot be absolutely certain. The same factors that militate against diagnosis militate against treatment.

In two of our cases, both men of the age of sixty, where no severe complications were found, collapse therapy was recommended and was successfully carried out. Nevertheless, in our opinion *collapse therapy in the aged*, with a few exceptions, *is not advisable*. We are dealing here with chronic fibroid disease and a low vital capacity, the result of long standing pathology. Then, too, extensive bronchiectasis is

often found, a condition not amenable to collapse therapy and often aggravated by it.

Rather than base our hopes on collapse therapy for the aged, we should attempt to envisage the long distance results of collapse therapy in the young. Late follow-up of collapse cases will undoubtedly constitute a factor in future preventive work. The pneumothorax patient, with a successful collapse, who is symptom free, sputum negative, and shows a reexpanded lung devoid of significant shadows is not, by any means, out of the woods. He may lead a normal life, marry, raise a family, and carry on his work or profession for fifteen or twenty years entirely oblivious of his tuberculosis, and then return as an active, progressive, far advanced case with multiple cavities and a positive sputum.

Education and follow-up are the answer. From a public health standpoint, as well as for the individual's own good, the patient should be instructed that the termination of his collapse treatment does not terminate his problem. He should be told that his tuberculosis is arrested or quiescent, but that the factors that rendered him primarily susceptible to tuberculosis are still present and will remain so probably to the end. The question of resistance should be stressed, and the patient encouraged to forestall "breakdowns" by clean and careful living and frequent physical, *x*-ray and sputum examinations.

The patient, in short, both for his own safety and in the interests of public health, should be given to understand that convalescence from active tuberculosis is not a matter of years, but of decades, and that the gains made must be continuously held.

Medical Clinics of North America
January, 1940. Chicago Number

CLINIC OF DR. CHARLES E. GALLOWAY

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SOME GYNECOLOGIC PROBLEMS IN OLD WOMEN

THE gynecologist is seldom called upon to treat women over sixty-five years of age but, as time passes, he will probably be called upon more often. The average duration of life now is about 62.8 years for females and 59.3 years for males. In 1920 the span of life averaged 56.4 years, in 1910 it was 51, in 1900 it was 49, in 1890 it was 43, and in 1800 it was about 35. Miles states that during the sixteenth century the average human being could expect to live only from twenty-six to thirty-four years. At the present time only about 5.4 per cent of our population are over the age of sixty-five, whereas, in 1850, only 2.6 per cent were of the same age group.

If one considers the fact that only 5.4 per cent are over the age of sixty-five and that roughly only half of those are females, it is easily seen that very few women will come for advice who are to be classed as old. Coupled with that fact is also one of equal importance, and that is that the senile changes in the reproductive organs start in earlier than in any other region of the body. The change is one of atrophy, but since the natural tendency is for the parts simply to become atrophic, we should not expect this natural process to become pathologic and in the large majority of women it does not. We therefore will see very few old women in the average gynecologic practice even over a long period of time.

When one is called upon to treat an older woman he should, as has been stated by many other authors, remember that senility is a physiologic entity like childhood and not a pathologic state of maturity. It has also been stated many times, and quite correctly, that in treating these patients the object is to attempt to restore the organ to a state of normal senility

and not normal maturity. Disease in senility should be regarded as a pathologic process in tissue that is degenerating.

The four most common pathologic conditions encountered by the gynecologist among the aged are *pyuria, prolapse, senile vaginitis* and *tumors*.

Pyuria.—Pyuria, of course, is generally associated with eversion of the urethra and associated caruncles. In a report of 822 patients over sixty-five years of age, admitted to Brooklyn State Hospital, Moses states that 95 per cent of the women had pyuria and 25 per cent of the men also had the same condition. As stated above, the pyuria is generally associated with cystocele or prolapse.

Case I.—Mrs. C. S., aged seventy-one; six labors, menopause at age forty-eight. This patient had no bleeding for one year and then regular profuse periods for one year and some irregular bleeding continued until she was fifty-five. There was complete prolapse of the uterus with a history of profuse bleeding only a few months before my first examination.

The chief complaint was bladder distress and a bearing down pain. The urine was not badly infected. The patient refused operation. A large ring pessary (*No. 5*) was inserted and it gave complete relief. This ring was cleansed and reinserted eleven times over the next two years and she then consented to be operated on. Under "twilight sleep" and local anesthesia, a LaForte operation was performed and she made a very good recovery, with complete cure of her condition. She has been seen twice since then and remains well.

It is only natural that the patient will try to be comfortable and well without resorting to surgery but we as physicians should not give advice or treatments that please the patients but rather that cure their disease. A ring pessary does not cure prolapse, and almost any woman capable of being up and about can withstand such simple procedures as colpocleisis.

One must always consult the patient, however, before closing the vaginal orifice. I have had two patients past the age of sixty-five who were still having intercourse and who expected to continue having it.

Case II.—Mrs. A. W. S., aged seventy-one; five labors and two miscarriages; denied disease and had had no operations. The chief complaint was "falling of the womb" and bloody discharge. No pain and no local or general symptoms were present. She had been conscious of the prolapse about eighteen months. The uterus came about half way through the introitus. The general physical examination did not reveal any other disease. The patient was operated on under ethylene anesthesia following the LaForte technic; a strip of vaginal skin about 2 cm. wide was removed from both the anterior and the posterior vaginal walls and the cut edges approximated with interrupted chromic catgut. She made a good recovery and obtained complete relief.

If the urine is grossly infected, the cystitis should be treated before doing the repair operation that will correct the anatomic defect that is causing the residual urine and infection. *Mandelic acid, heat* and *diet* are the three chief means of combating the infection, and at the same time a ring pessary may be used temporarily. I have also known some women to treat themselves by using either cotton tampons or one of the various commercial products now advertised. The patient in Case III was one of these. She was teaching school and wanted to remain in her position until the age of sixty-five when she would be retired on a pension:

Case III.—Mrs. M. C., aged sixty-four, three labors, no miscarriages; history of tuberculosis at the age of twenty-three and gastric ulcer at sixty-one. This patient had complete uterine prolapse of eight months' duration; there was no bleeding but there was a constant desire to void. She maintained the uterus in position during the day by inserting a ready-made vaginal tampon and was quite comfortable except when seated. The urine cleared up with the use of mandelic acid and heat. She was examined five times over a period of eighteen months, when she received her school pension and was then operated upon. She had what looked like a small pedunculated fibroid on the cervix which had been present for twenty-one years. This later proved to be a cyst. She was operated on according to the Manchester technic. She obtained complete relief, and

she also said that the repair had resulted in normal bowel movements for the first time in six years.

Vaginal Relaxation.—The next case illustrates the difficulty encountered in treating some cases of vaginal relaxation. A few patients will have recurrences of cystocele, rectocele and prolapse in spite of careful surgery and other management.

Case IV.—Mrs. M. S., aged sixty-eight, a baby nurse who was required to work but who was very miserable due to repeated attacks of cystitis, was first seen July 22, 1937. She gave a history of two labors and a vaginal repair performed in 1931. The systolic blood pressure was 220 and the urine was badly infected. She had a large, soft, red rubber ring in the vagina which she replaced herself from time to time. She was treated like the patient in Case III with mandelic acid and heat and was then operated on August 6, 1937, following the Manchester technic. She made a good recovery but, by November, 1937, the anterior vaginal wall was beginning to bulge again and she again had almost a complete cystocele. Colpocleisis will be tried next if she will again submit to surgery.

Senile Vaginitis.—The most common pathologic condition seen in old women is vaginitis. It may also be associated with cervical polyps, eversion of the urethra, or caruncle. In most cases Monilia can be demonstrated. I have also found Trichomonas in one patient past the age of sixty-five:

Case V.—Mrs. L. G., aged seventy-four; history of two labors and two miscarriages; no surgery. This patient was under the care of an internist at the time who said she had cirrhosis of the liver and nephritis. She was complaining of a profuse, watery irritating discharge with some blood in it. There was no pelvic pain but there was some backache. Pelvic examination showed a very red introitus, very thin serous discharge, and punctuate excoriations over the upper half of the vagina, showing bright red spots against a reddish yellow background. This same condition extended over the cervix. There was a small polyp coming out of the external meatus of the urethra. The vagina admitted only one finger. No

yeast organisms or Trichomonas were found. The polyp was removed under local anesthesia, using a small loop cautery. The patient was then given amniotin suppositories to be inserted each night and a douche of lactic acid solution each morning. She was not seen again, but several weeks later her daughter reported she was quite comfortable and free from discharge.

It is doubtful that the female sex hormone can have much effect on the state of the vagina at the age of seventy-four, but the other ingredients of the suppository may be beneficial and we know that the vagina is supposed to have an acid reaction, thus the prescription for the lactic acid douche. The patient is given a prescription for an 85 per cent solution of lactic acid and told to use a teaspoonful in each douche-bag of hot water. If Monilia are found in the secretions, as they frequently are, the most efficacious treatment is to paint the vagina with half diluted Lugol's solution twice a week, then have the patient insert a capsule in the vagina each night as recommended by Hesseltine, and take a douche of lactic acid each morning for about twelve days.

The prescription for these capsules is as follows:

R. Potassium iodate 035
Potassium iodide 215
Kaolin (colloidal neutral)
q.s. to fill #000 gelatin capsules
Misce et fiat pulvis
D.T.D. #XII

It is quite important to request colloidal neutral kaolin.

Gentian violet, 1 per cent solution, has been recommended for years in treating yeast invasions of the vagina, but this requires office visits and many patients develop a severe chemical vaginitis from this agent.

Caruncles.—Some degree of eversion of the urethra is almost the rule among older women, many times associated with urethrocele and many times accompanied with caruncle formation on the posterior aspect of the meatus. Most caruncles are granulation tissue, and a great many of them are very painful. Very few are malignant.

The author generally treats them in the office by *injecting novocain* and then *fulgurating* them with the electric current.

This generally gives complete relief after two treatments. Now and then, however, the lesion is rather large and biopsy is desirable.

Case VI.—Mrs. F. J. O'C., aged sixty, had had four labors and no miscarriages. One ovary and the appendix were removed at the age of twenty-five. Two of the four deliveries occurred subsequent to that operation and menopause occurred at the age of forty-nine (late for a woman with one ovary). This patient's complaint was painless bleeding for seven days. She had a normal pelvis except for a soft, red, bleeding polypoid type of tumor at the external meatus; this measured about 1.5 cm. in diameter and involved both the anterior and posterior urethral wall. She was taken to the hospital and, under local anesthesia, the radio knife was used to remove the upper and largest portion of the growth and several interrupted catgut sutures were placed to control bleeding. The microscopic report was "ulcerated, chronically inflamed urethral caruncle with thrombosed, partly organized varicose veins in its center and base." It was planned to remove the remainder at some future date, but the patient has been examined six times over the three-year period since the operation and the meatus, although not as small as normal, is quite all right.

Atresia of Cervical Os.—Atresia of the cervical os is common among old women, and occasionally back of it will form either a hematometra or a pyometra. The author has recently had a case in which, first, a small probe was passed, followed by a larger one, resulting in the drainage of about ½ ounce of mucopurulent material.

Tumors.—Over the age of sixty-five one will find that many of the cases that bleed are not due to tumors, but tumors must always be kept in mind even at that age. Taylor and Millen, reporting 406 cases of bleeding after the menopause, found that 63 per cent were caused by some malignant tumor and 17 per cent by some benign tumor.

Leukoplakic Vulvitis.—Leukoplakic vulvitis, especially if any ulceration is present, should be treated by *surgical removal* rather than medically. It has been stated that the condition in 50 per cent of these cases will become malignant due to the fact that a certain number have been observed over a

period of time that were found to be carcinoma when operated on. The truth, if it could be known, is that the lesions were probably already carcinomas even when first seen.

Case VII.—Mrs. V. S., aged sixty-eight, gave a history of three labors. Her gallbladder was removed in 1934. She was first seen in 1938. The report as she came in was that she had had perineal warts with extreme itching for some time and that she had been treated for quite some time before by a dermatologist, but that one of her warts had "come back" and was ulcerated, bleeding and itching as before. All of both labia were involved, the skin being white, moist, cracked and thickened, and on the upper part of the left labium was a large, raised, mulberry-like, red, bleeding growth about 2 cm. in diameter. Both inguinal regions showed palpable tender glands. The pelvic organs were normal for her age.

Complete vulvectomy and resection of both inguinal glands was performed and her immediate recovery was quite good. She died of pulmonary embolism on the nineteenth postoperative day. This was a blessing in disguise, however, because autopsy revealed carcinomatous glands at the bifurcation of the aorta.

Case VIII.—Mrs. M. M., age seventy-four years. Three labors, no miscarriages. In 1932, she had a partial vulvectomy at another hospital. Several years later she began to have discomfort, but when the author first saw her in 1939, she had not been seen for one year—at this time an ulcerating carcinoma of the left vulva was found to be present. There were palpable glands in the inguinal regions. The pelvic organs were atrophic. A vulvectomy was performed with excision of the inguinal lymph nodes on the left side. One week later the inguinal glands on the right side were removed. The pathologic report confirmed the diagnosis of carcinoma of the vulva and metastases of the inguinal glands were present on the left but not on the right. Postoperative course was complicated by infection in the right inguinal wound and thrombophlebitis of the right femoral vein. This subsided and the patient was discharged approximately three weeks after the operation.

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Medical Clinics of North America
January, 1940. Chicago Number

CLINIC OF DRS. WILLIAM R. CUBBINS, JAMES J. CALLAHAN AND CARLO S. SCUDERI

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DISEASES OF THE SKELETON IN THE AGED: FRACTURE OF THE NECK OF THE FEMUR AND ITS MANAGEMENT

TODAY we have before us a woman, sixty-two years of age, a housewife, who has borne four children. She is 5 feet 6 inches tall and weighs around 135 pounds. Aside from the diseases of childhood and the births of her children, there are no items of interest in her history.

One week ago, about four o'clock in the afternoon, she arose from her sewing table, caught the heel of her left shoe in a hole in the rug, and was thrown to the floor; she was unable to arise therefrom because of pain in the left hip joint region, inability to move the leg, and great faintness. The other members of the household carried her to bed and, when the doctor examined her, he found that the foot and leg were rotated outward and that there was 1¼ inch shortening. There was no local tenderness over the hip or thigh, but any attempt at motion produced great pain and discomfort.

A sedative was given, and the patient was taken to the hospital and an *x*-ray plate was made of both hip joints. The *x*-ray of the left hip showed that there was a fracture of the neck of the femur with what appeared to be a transverse fracture. The neck was in a varus position, being almost horizontal. This clinched the diagnosis and now we come to the question of differential diagnosis:

Differential Diagnosis.—The differential diagnosis should always begin with a history, and one must constantly remember that in injuries to the hip and the upper part of the thigh, the amount of force expended in the production of the injury is of great significance and that an individual who merely falls,

as this woman did, seldom has a dislocated hip joint. It requires great force to produce a dislocation, and whether that dislocation be anterior, posterior, or inferior, the limbs must be spread apart and in a position of flexion before a dislocation can be produced.

A *dislocation* posterior presents the limb flexed, rotated, inward, and firmly fixed; a dislocation posterior shows the thigh and leg rotated outward, the knee flexed, and the limb held firm and rigid. An inferior dislocation is extremely rare and is accompanied by a marked abduction with flexion.

We will now have the patient anesthetized. The next question of differential diagnosis lies between a fracture of the neck of the femur and what should be spoken of as a "pre-trochanteric" fracture. These *pre-trochanteric fractures,* as a rule, require greater force than a fracture of the neck, and they are always tender over the trochanter major. Discoloration frequently accompanies a pre-trochanteric fracture, whereas a discoloration from a fracture of the neck is uncommon. If one has a *fracture of the neck of the femur,* with an oblique line of fracture and if the capsule is perforated by one of the other fragments, it must be quite obvious that the blood from the fractured neck can and will pass through the tissues so as to cause a large hematoma, either on the anterior surface of the hip joint, or in the posterior area.

The *x*-ray must be very carefully examined for the peculiar rarefactions that accompany metastatic malignant growths. And when such a rarefaction appears, a careful examination of the breasts in the female, and of the prostate gland in the male, must be made. When these areas are negative and there is no history of any other lesion that might be malignant, the possibility of a bronchogenic carcinoma must be considered.

Pathology.—During our operations on approximately 350 fractures of the neck of the femur, we have observed many and various changes that are not in the average text:

The first thing that one must observe is the *direction of the fracture line* in the neck of the femur. Too long has it been considered that all these fracture lines are transverse. As a matter of fact a purely transverse fracture of the neck of the femur is not common. Oblique lines of fracture from behind, forward and downward, from above downward, or

from forward backward, are the common lesions. If we have an oblique line of fracture, it is not uncommon to have a sharp point on the proximal anterior fragment perforating the capsule and locking in the capsule, so that an accurate reduction of a fractured neck is many times impossible with any type of manipulation.

We have also found that one may have a fracture of the neck in which the *periosteosynovial membrane may be detached from the anterior inferior fragment and then dropped down in between the two fragments in such a manner as to prevent a union of these fragments.* This membrane also may be detached from a proximal fragment and then dropped down between the fragmented ends.

The third pathologic condition present in these fractured necks of the femur that has not been properly described is *incomplete fracture.* This incompleteness may consist in just an oblique green-stick fracture such as may occur in a young individual; or it may be a transverse fracture with the line of fracture through the anterior portion of the neck with the posterior cortex and periosteosynovial membrane intact. And we have had two cases in which the anterior portion of the capsule remained intact, the fracture being posterior. We believe that these incomplete fractures occur as often as in from 3 to 5 per cent of the cases observed. As a rule there is no deformity, no shortening and, if the patients are kept quiet and recumbent, most of them will recover without any treatment.

When one takes *skiagrams* of an injured hip, he should be sure to take skiagrams of *both hips* in order to observe the peculiar rarefaction of the lines of bone support which are arranged to curve in every direction to give maximum strength to the structure. As a rule this rarefaction is bilateral and symmetrical. It was described very beautifully, about ten years ago, by Dr. Joel E. Goldthwaite, of Boston, and published in the Journal of Bone and Joint Surgery. A bone that has undergone the above type of resorption is much more easily fractured than one in which no such change has occurred. In order to fracture the neck of the femur in a husky young adult or middle-aged individual, a great amount of force is required because of the firmness of the structure. And when

one uses a nail or a screw or a bone graft, it is much more difficult surgery than where rarefaction has occurred, as is the case of the woman we are operating on today.

The amount of *hemorrhage* in a joint in a fracture through a rarefied neck of the femur of an aged individual is not extensive, but in a young or middle-aged individual, where there has been no resorption and no atrophy, the hemorrhage is marked and extensive.

Prognosis.—The prognosis in a case of fractured neck of the femur without open reduction, irrespective of the position of the fragments as shown by the *x*-ray, continues to be very doubtful because of the interference with bone growth as described under Pathology. The conservative treatment in 300 cases in which extension and Whitman casts were used at Cook County Hospital gave us 44 per cent successes. Failure to secure union in the neck of the femur is not due to the patient's age; it is due to the factors detailed under Pathology. We have had relatively young men and boys with fractures of the neck of the femur and a non-union after careful conservative treatment in whom the *x*-ray showed an apparent reduction into correct position.

Treatment.—We are firmly convinced that opening the hip joint in this case, with the incision described by us and originated by Dr. James J. Callahan, is the safest procedure. We are still convinced that the instrument devised by Dr. Carlo Scuderi is best adapted to the accurate reduction and fixation of the fragments.

Owing to the fact that we have frequently opened the hip joint following what we thought was an adequate reduction by the Leadbetter or other methods and found that the fragments were not anywhere near in apposition, we have been very much opposed to the blind pinning of these fractures. This opinion is not based entirely upon opposition to blind pinning, but is due to the many times that we have personally tried to insert screws, nails, bone pegs and other gadgets through the trochanter into the proximal fragment with a closed joint and failed.

The head of the femur, if it is hard and firm and of the type present in a husky middle-aged male, is extremely diffi-

cult to penetrate. And it is also difficult to hold these fragments in position while this very sharp, two-edged flange penetrates the proximal fragment. In the older individual, with rarefaction present, the procedure is simpler, but it cannot by any manner of means be considered certain without having the fragments visualized and a visualization of what is going on during the insertion of the foreign body.

You have read about impacted fractures of the neck of the femur and Dr. Fred Cotton has spoken long and loud concerning reduction of the fracture and its subsequent impaction. But we have found that with these fragments in perfect alignment and held in that position with a flange, one can beat the trochanter major into a pulp without making any impaction.

Operation.—During our discussion of the pathologic findings the patient had been placed on a Hawley table and the proper degree of extension made. It should be stated here that too much extension may separate the fragments rather widely. The field of operation, which was shaved, scrubbed with soap, water and alcohol, and to which dry dressings were applied twenty-four hours previously, is now uncovered. Two paintings of Arnold's solution are used, the field of operation is draped, and we are ready for the incision.

We begin this incision at the anterior superior spine of the ilium and carry it down through the skin about 5 inches; we then make a hockey-stick curve downward and backward to the groove between the vastus lateralis and the biceps femoris. The small bleeding vessels are clamped as they appear. The fascia is now incised along the same line which is between the belly of the sartorius and the tensor fascia lata. It then curves down, following the skin incision, and divides the tendon of the tensor fascia lata. A sharp dissection is now carried down and exposes the external circumflex vessels. These must be clamped and tied, as they are the only vessels of importance that are divided with this incision.

The flap described above can now be pushed farther back and out to expose very clearly the anterior and upper portion of the capsule of the hip joint. This capsule is now incised from the acetabular ridge down and out to its insertion into the upper end of the intertrochanter line. A second transverse

incision is now made up near the acetabular border and the lower anterior portion of the capsule is detached from the intertrochanteric line.

We will now retract this capsule. Here lies our fractured neck, clearly visible. It is a short, oblique lesion and there is very little tissue interposed and the osteoperiosteal membrane is firmly attached to the neck at the line of fracture. A few tags can be seen hanging down. With a periosteal elevator inserted between the fragments we now rotate the proximal fragment upward and forward to inspect the fractured surface, and so that we may take a scoop out of this cancellous bone for microscopic examination. The distal fragment is now rotated out by a move similar to the one used previously and a curet of the proximal portion of the distal fragment is obtained. As we removed this specimen from the proximal fragment there was no bleeding. The area appeared white and fatty. As we look at it at the present time there is still no bleeding from this tissue. From this evidence we can state that the head of this bone is in all probability dead from a microscopic standpoint. In other words it will not take a stain of a nuclear type and the pathologist will report it as necrotic bone of an aseptic type. Just how frequently this condition is present as early as one week following a fracture we are not able to state.

We now pry these fragmented ends into position. In this case it is simple. We now make an incision in the aponeurosis of the vastus lateralis and uncover the outer surface of the femur, just below the trochanter major. The sharp point of the Scuderi director is now inserted into the edge of the acetabulum, parallel with the aligned fragments of the neck of the femur, and we determine that the correct length of the flange to be used is No. 4. The block is now firmly fixed into the outer cortex of the femur just below the trochanter major and locked. A flange of requisitie length is now inserted through the block and driven home until the proximal fragment is firmly fixed. The director and block are now removed and the flange is sunk down close to the cortex of the femur, and the force is continued until the lines of fracture are exact and the surfaces in contact.

The necessity for this impaction is that the head remains

very hard and, as the flange enters the head, the distal fragment is pushed away. We now have the edges of the fractured bone in apposition; we test the movements of this femoral shaft and neck, find that the fragments move in unison and that there is no fixation caused by the flange entering the acetabulum.

A suture of catgut now closes the wounds in the capsule. A mere approximation is all that is essential. The fascia is now closed with catgut, care being taken to leave a defect so that the excess extravasated fluid may escape. The skin is closed with clips or silk, spaced not closer together than ¾ inch. The wound is now dressed, the limb placed in the Thomas splint, with adhesive traction from just above the knee.

The patient will be returned to bed and extension will be continued with 7 to 10 pounds of weight in order to avoid any accident while coming out of anesthesia.

Three weeks later the traction will be placed on the thigh above the knee and a Pearson attachment used on the Thomas splint to obtain early and free knee motion. At the end of six weeks this patient will be up and around in a caliper. When good bone formation is present, the caliper will be removed and she will walk with or without a cane.

Note.—The pathologic report on the above fragments, made by Dr. Hirsch at St. Luke's, was reported to be in the condition of aseptic necrosis.

One year later: This woman has a firm bony union. The flange was removed at the end of six months. She is now walking around in a perfectly normal manner.

Medical Clinics of North America
January, 1940. Chicago Number

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ENDOCRINE PROBLEMS IN LATER LIFE

MOST body functions, from conception to death, are under hormonal control, but the mechanism of this control is not clearly understood. As our knowledge of endocrine function in later life increases we shall probably have a better understanding of the ageing process. Some observers have attributed the changes associated with ageing to reduction in sexual activity and have attempted to rejuvenate old men with testicular transplants. The gradual reduction in the production of energy per square meter of body surface with age would suggest a gradual reduction in thyroid function. There are reasons for believing, however, that the process of ageing is a complex one and involves perhaps all glands of internal secretion and the tissues which they stimulate. Some light may be thrown on the problems involved by a consideration of diseases of specific glands of internal secretion.

DISEASES OF THE THYROID

Hypothyroidism.—Hypothyroidism is most common between the ages of thirty and fifty years, but about a third of the cases occur after the age of fifty and about a quarter of them between the ages of fifty and sixty.

There is one very important consideration about the *treatment* of myxedema in older people which should be stressed, namely, the development of coronary thrombosis. Whether its development is facilitated by myxedema or is related merely to the age and some other constitutional factor of the individual, are problems still to be solved. Younger patients will

tolerate rather rapid changes in basal metabolism, although, as we have pointed out elsewhere,[1] the rate should always be changed slowly to avoid unpleasant symptoms. In older patients with myxedema, *a serious attack of angina pectoris or of coronary thrombosis may be precipitated by increasing the basal metabolism rapidly to normal.* Such patients may tolerate small doses of thyroid well. Therefore, in older patients, the metabolism should be raised gradually and the initial dose should not exceed ½ grain of U. S. P. thyroid daily. If there is any suggestion of angina, the basal metabolism should be held at a somewhat subnormal level, as for example, minus 15 or minus 20 per cent.

We recall one patient with myxedema about sixty years old who tolerated very well two separate doses of thyroid preparations, each of which contained 1.63 mg. of iodine and produced an increase in her basal metabolism from minus 40 per cent to minus 20 per cent approximately. A little later, when her metabolism rose from minus 40 per cent to within normal limits during the administration of twelve daily doses of desiccated thyroid, each containing 0.5 mg. of iodine (total 6.0 mg. of iodine), she suddenly developed severe precordial pain, a pericardial friction rub, fever and leukocytosis—typical manifestations of coronary thrombosis. After the acute attack subsided, decompensation persisted, although she lived for several months. During this period her existence was an uncomfortable one. She was unable to tolerate more than minute quantities of thyroid because of exaggeration of angina and heart failure, some degree of which was always present. In another 65-year-old patient with myxedema as little as ¼ grain of U. S. P. thyroid daily precipitated severe attacks of angina pectoris and the patient died of coronary thrombosis while receiving this small dose.

Toxic Goiter.—Most cases of toxic goiter occur between the ages of fifteen and fifty years, although the disease is by no means absent after the age of fifty. In older people the sex difference is less marked and there is a higher incidence of nodular goiter with hyperthyroidism (toxic adenoma).

The *treatment* of the disease in later life, regardless of the age, is the same as in younger individuals, namely, thyroidectomy following suitable preparation.

We have discussed elsewhere[2] the various factors of importance in improving the preoperative condition of the patient and it will not be necessary to repeat them here. It may be pointed out, however, that the single most important factor in determining the outcome of operation is the *preoperative condition of the patient.* With adequate preparation, the mortality in old people is very little higher than in young individuals.

There are, however, certain changes associated with the ageing process that increase the mortality slightly. The most important factor is the higher incidence of *heart disease,* largely of the hypertensive and arteriosclerotic varieties. Hyperthyroidism per se does not cause cardiac decompensation, and when decompensation is present, it indicates that the heart is independently damaged. It is usually unwise to perform a thyroidectomy in the presence of cardiac decompensation and some difficulty may be experienced in clearing it up, particularly in older patients. If, with the usual measures of rest, a high caloric diet, iodine and digitalis, the cardiac condition fails to improve, a considerable amount of preoperative improvement may be produced by the use of roentgen ray therapy directed over the thyroid. In some instances long periods of time are required to prepare the patient for operation, but by exercising the greatest care in preparation and carrying out the thyroidectomy in at least two stages whenever there is any doubt about his ability to stand the strain of operation, years may be added to his life.

We can recall a sixty-year-old man who for more than a year while in the hospital was decompensated and confined to bed most of the time. After the most painstaking preparation, this decompensation finally cleared up. Following ligation of one superior pole, which was done to test the patient's ability to withstand operative procedures, he stood two hemithyroidectomies very well, following which he developed myxedema. He now tolerates thyroid well in a dose large enough to raise his metabolism to normal; his fibrillation and edema of rather long standing have disappeared, and he works as a janitor.

The risk of operation in the presence of heart disease without decompensation is very little more than in the absence of heart disease. Many elderly people with toxic goiter have the

notion that their age is a contraindication, but this is an erroneous impression.

SEXUAL DISTURBANCES IN THE MALE

Alterations in sexual function in the male with advancing years are not well worked out. There are no such epochs as menstruation, pregnancy and the menopause in the female. In order to understand sexual disturbances in the male it is necessary to review very briefly the physiology of the testis: The testis consists essentially of two parts, the seminiferous tubules, the most important function of which is to produce spermatozoa, and the interstitial cells of Leydig, the most important function of which is to produce male sex hormone. Upon the production of male sex hormone depends the development of secondary sexual characteristics, including the growth of the penis, scrotum, prostate, seminal vesicles, vas deferens, body hair and beard, change in the pitch of the voice and, to some extent, skeletal development, including the contour of the body.

The form in which the male sex hormone is secreted and circulates is unknown. The most active androgenic material isolated so far from the testis is testosterone. This is now made synthetically. Certain esters of testosterone are more active than testosterone itself and, for clinical work, the propionic acid ester, *testosterone propionate,* is used.

An intimate relationship exists between the function of the testis and that of the pituitary. Gonadotropic factors are produced in the pituitary which influence gonadal function. Two gonadotropic effects are noted which may or may not be related to the production of two gonadotropic factors by the anterior lobe: One influences the function of the seminiferous tubules in the testis and the development of ova in the ovary (*follicle-stimulating hormone*) and the other stimulates the interstitial cells of the testis and causes luteinization in the ovary (*luteinizing hormone*). The sex hormones in turn are supposed to inhibit the function of the pituitary. An excellent example of the delicate balance which exists between the pituitary and the gonads is seen in the menstrual cycle in the female.

Some idea of testicular function may be obtained by

spermatozoa counts and by determination of the excretion of androgenic material in the urine. Such observations are, however, very inadequate for the different age periods. The small number of observations available show only slight excretion of androgenic material in boys and girls from six to ten years old (0.7 to 2.0 international units per liter) (Koch)[3]. A marked increase appears to begin about the time of puberty, the urine of an adult male containing from 40 to 100 international units per twenty-four hours (Koch).[4] Spermatogenesis also begins at puberty. The small amount of data available appears to indicate that both functions decline with advancing years, but there is no sharp line of demarcation like the menopause in the female. Kochakian,[5] for example, found that young men between the ages of twenty-one and twenty-nine years excreted 12 to 16 capon units of androgenic material per liter of urine, while five men fifty to seventy-two years of age excreted an average of from 2 to 3 capon units. According to Engle,[6] the testes and ducts of 50 per cent of men more than seventy years of age show abundant spermatozoa, and spermatogenesis has been demonstrated in a man ninety-four years old. There are numerous instances of persistence of sexual activity in very old men. Nevertheless, there does appear to be in many instances some waning of sexual vigor with advancing years.

For some undetermined reason, female sex hormone appears in male urine (the equivalent of 10 gammas of theelin per day) and male sex hormone appears in female urine (30 to 100 international units per day). The origin of *estrogenic material* in male urine is unknown. According to Koch,[4] there are three possibilities concerning its rôle: (1) It may be a degradation product of some androgenic material, (2) it may control the anterior lobe of the pituitary, or (3) the relationship between estrogenic and androgenic material may have some bearing on hypertrophy and hyperplasia of the prostate.

Two types of *treatment* are possible in testicular disturbances:

1. Stimulation therapy with gonadotropic material.
2. Substitution therapy with male sex hormone (testosterone propionate). It is in pituitary disturbances primarily that stimulation therapy is indicated and these disturbances occur for the most part before the age of fifty. Three dis-

orders in older men deserve some consideration, namely, *impotence,* the *male climacteric* and *benign prostatic hypertrophy.*

Impotence.—Many cases of impotence are psychogenic in origin. The most important thing, therefore, is to determine the cause of the impotence. If it occurs in otherwise healthy men who have been potent all their lives, there is some reason to believe that it may be the result of a glandular deficiency. When this is the case, striking improvement may be expected with glandular therapy. Either the stimulation or substitution type of therapy may be effective provided the testis is capable of response. There is some question as to which type is preferable.

The best gonadotropic material to use is the *anterior pituitary-like principle of pregnancy urine,* which is available under a variety of trade names (*A. P. L., Follutein, Korotrin, Antuitrin-S,* etc.). Material from the pituitary itself or from the serum of the pregnant mare does not seem to be very suitable for this purpose. We have observed the development of acute retention in a man with benign prostatic hypertrophy during the administration of the anterior pituitary-like principle and have seen aggravation of the condition in others during the administration of testosterone propionate. Both of these materials are therefore to be used with caution in older men.

The Male Climacteric.—A condition has been described in some men resembling the climacteric in women. It is characterized by hot flashes, weakness, nervousness, irritability and emotional instability, sometimes associated with excessive worry and morbid fears. Sexual and bodily activity are diminished.

With *testosterone propionate* such individuals may show striking improvement. Their muscle strength increases, their emotional disturbances vanish, sexual activity increases and self-confidence and a capacity to do their work well return. The condition is not well worked out, however, and care must be exercised to prevent confusion of the psychic and physical effects of therapy. The only valid excuse for reviving sexual activity in older men is its influence on bodily activity in general.

That the male sex hormone does profoundly influence the function of the body as a whole is demonstrated by the effect

of testosterone propionate on younger eunuchoid individuals. In such patients, its effect in large doses is spectacular. It produces marked genital growth and stimulation of development of all secondary sexual characteristics, including enlargement of the penis and prostate and an increase in body weight and in the strength and firmness of muscles. Effeminate characteristics disappear and individuals become much more aggressive, alert and masculine. They become capable of much greater physical and mental effort. There is reason to suppose that some similar changes in general bodily activity might be noted in older men with waning sexual function, and actual observations appear to indicate that they are.

Caution must be urged with this form of therapy because of the possibility that it may cause enlargement of the prostate.

Benign Prostatic Hypertrophy.—Benign prostatic hypertrophy is one of the more common afflictions of older men. About four out of ten men after the age of sixty show some degree of it.

Several reports have appeared purporting to show that male sex hormone alleviates this condition. On theoretical grounds this is difficult to understand. Production of male sex hormone is responsible for the development of the prostate at the time of puberty. Development of the prostate can be produced in eunuchoid individuals by administration of testosterone propionate, and in young boys by administration of this material or gonadotropic factor from the urine of pregnant women. Castration and atrophy of the testes produce atrophy of the prostate. Benign prostatic hypertrophy occurs at a time when the production of male sex hormone is supposed to be reduced. As a matter of practical consideration, Heckel and Thompson[7] have been unable to produce any improvement in a series of twenty-two patients with benign prostatic hypertrophy by the administration of testosterone propionate. Some of the men felt slightly more energetic while taking it, as might be anticipated, but there was no reduction in residual urine and no improvement in any other abnormality related to the prostatic hypertrophy.

Testosterone propionate is an important therapeutic agent but, as with any other potent preparation, there has been a tendency to use it in a great variety of conditions for which

there appears to be no rational basis. A similar state of affairs has obtained in the case of the thyroid hormone, which has been used in the most varied assortment of diseases from skin disorders to pulmonary emboli.

The only clear-cut indication for the use of testosterone propionate is a diminished production of male sex hormone, particularly as observed in castrate and eunuchoid individuals. In such cases it is specific and is effective regardless of the age at which it is administered.

In addition to the possibility of aggravating rather than alleviating benign prostatic hypertrophy, another possible source of danger must be pointed out in old men. In those with heart disease, the increased vigor associated with the administration of testosterone propionate sometimes increases body activity enough to precipitate *some degree of cardiac decompensation.*

A word should be said about the *dose of testosterone propionate:* The doses often used in the past (from 1 to 5 mg.) were too small to be effective. The desired results can rarely be produced with less than 25.0 mg. per day and it may be necessary to use 50 mg. per day.* Concentrations of less than 25.0 mg. per cc. are for most purposes impractical.

DISEASES OF THE OVARY

The Menopause.—The most important disturbance of ovarian function in later life is the menopause. The menopause is a phenomenon that appears to be confined to the human. In animals, sexual function diminishes with age but in some forms can be made to return with gonadotropic material. In such animals ova persist in the ovary. In the human, the number of ova in the ovary appears to decrease gradually during the reproductive period and they finally disappear during the menopause. The response to gonadotropic stimulation also appears to diminish with age.

All of the characteristic changes of the menopause can be induced by castration earlier in life, namely, cessation of menstruation, decrease and final disappearance of urinary and blood estrogen (except in pregnancy), and a marked increase in

* Our experience is based on the use of Oreton, the product of the Schering Corporation.

gonadotropic substance in urine and blood. Associated with these objective changes are subjective changes characterized by vasomotor and emotional disturbances, namely, hot flashes, periodic increase in perspiration and emotional instability. The gonadotropic material in the blood and urine is primarily of the follicle-stimulating variety and thereby differs from that which is present in the urine of pregnant women, which is primarily of the luteinizing variety. Its increased concentration after the menopause is usually attributed to an increase in pituitary activity resulting from loss of estrogenic inhibition. According to Kurzrok and Smith[8] the increase in gonadotropic factor appears to indicate that the menopause is not related to any deficiency of pituitary activity but appears to be the result of failure of the "end-organ," *i. e.*, the ovary, to respond to stimulation. In other words, according to these authors, it is primarily the result of ovarian failure. According to Engle,[9] the ovary appears to be unresponsive to gonad-stimulating material early in life. A certain period of ageing is necessary, following which a period of fertility ensues. This in turn appears to be followed by a loss of ability to respond and by loss of a characteristic feature of the functional ovary, namely, the ova.

According to Albright[10] the symptoms of the menopause are referable to the increased production of gonadotropic factor, but regardless of the mechanism involved, the main therapeutic consideration is that they can be relieved with estrogenic material.

The menopause does not occur abruptly. Irregularities in menstruation are often present for several years before actual cessation occurs. According to Webster, in temperate countries the menopause takes place in about 50 per cent of women between forty-five and fifty; in 25 per cent, between forty and forty-five; in 12.5 per cent, between thirty-five and forty; and in 12.5 per cent, between fifty and fifty-five. Symptoms often persist years after the cessation of menstruation. The symptoms may be very mild and in some cases entirely absent, while in others they are marked and include states of depression and morbid fear.

The response to *estrogenic treatment* is characteristic and striking. In addition to the subjective changes, there occurs a

change in the vaginal smear from the castrate type to the interval type, as demonstrated by Papanicolaou and Shorr.[11] The effective dose varies from 500 to 10,000 international units per day. A great variety of natural and synthetic estrogenic materials are available for treatment. They vary in potency, the synthetic material, estradiol, being two and a half times as potent as theelin, a urinary product. For adequate therapy it is necessary to administer them subcutaneously.

Considerable interest has recently been aroused by *diethylstilboestrol* (4,4′-dihydroxy-*α*, *β*-diethyl stilbene), a new synthetic compound with a simpler and entirely different formula from that of estradiol and its derivatives. Stilboestrol is effective by mouth in a dose of from 1 to 5 mg. daily. It not only relieves subjective symptoms, but produces the characteristic changes in the vaginal smear and may induce uterine bleeding and cause an increase in the size of the breasts. It is very inexpensive—one hundred 1 mg. tablets being available at retail for only about 75 cents. Certain unpleasant symptoms are sometimes associated with its use, namely nausea, vomiting and perhaps some liver damage. It is too early yet to say what the status of this drug will prove to be, but it offers interesting possibilities.

PITUITARY DISEASE

Pituitary disorders are rare after the age of fifty, but they may occur at any age. The *Fröhlich syndrome* may persist, and *hypopituitarism associated with chromophobe adenoma and craniopharyngioma* may persist or make its appearance in later life. *Simmonds' disease* sometimes develops after the sixtieth year. *Acromegaly* usually begins between the ages of twenty and thirty years and has usually burned out by the age of fifty, but there are cases on record in which the disease has persisted for as long as fifty years, and it has been observed in active form as late as the age of eighty years.

The *treatment* is the same as at any age, namely, appropriate glandular therapy for hypopituitarism and roentgen therapy over the pituitary for acromegaly, except in those cases in which the disease is associated with pressure on the optic chiasm, when operative procedures must be resorted to. This is done reluctantly at any age, but particularly in older people.

The glandular therapy of hypopituitary states is very unsatisfactory because of inadequate pituitary extracts. Some improvement may sometimes be produced by correcting the associated hypothyroidism with desiccated thyroid and the ovarian abnormality with gonadotropic principles or sex hormones, as the case may be. In younger patients gonadotropic preparations are preferable, but in older patients, the sex hormones themselves.

Cushing's description of so-called pituitary basophilism has stimulated speculation about the relationship between the basophile cells in the pituitary and blood pressure. Both increase with age, but according to Rasmussen[12] there is no statistical correlation between them.

DISEASES OF THE SUPRARENALS

Diseases of the suprarenals are encountered very infrequently in later life. A few patients develop Addison's disease after the age of fifty years. The *treatment* is exactly the same as in younger individuals and has been outlined elsewhere.[13]

SUMMARY

The ageing process is a complex one and probably involves all the glands of internal secretion and the tissues which they stimulate.

About a third of the cases of myxedema occur after the age of fifty and about half of them between the ages of fifty and sixty. Coronary thrombosis is a serious complication of treatment in older people and may develop when the metabolism is raised rapidly to the normal level. The initial dose of desiccated thyroid should not exceed ½ grain (U.S.P.) daily and, thereafter, changes in the dose should be made gradually.

The treatment of toxic goiter is the same in older individuals as it is in younger patients, namely, thyroidectomy following adequate preoperative preparation. The single most important factor in determining the outcome of operation, regardless of the age, is the preoperative condition of the patient. The most important difference in toxic goiter in later life is the higher incidence of heart disease, which is chiefly of the hypertensive and arteriosclerotic varieties. This increases the mortality slightly. Hyperthyroidism per se does not cause cardiac

decompensation and, when decompensation is present, it indicates that the heart is independently damaged. When decompensation is present, it is usually desirable to wait until it disappears before undertaking operative procedures.

The changes in testicular function with advancing years are not well worked out, but there appears to be some decrease in the rate of production of male sex hormone and of spermatozoa. In some instances impotence and a condition known as the "male climacteric" may be associated with these changes and be corrected by glandular therapy. This may be either of the stimulation variety (gonadotropic material) or of the substitution variety (testosterone propionate). Such treatment must be given with great care in older men. The increased activity associated with an increase in the amount of circulating male sex hormone may tax the cardiac reserve and precipitate cardiac decompensation, and the stimulation of the prostate may aggravate prostatic hypertrophy. In spite of numerous reports to the contrary, treatment with male sex hormone does not appear to be effective in benign prostatic hypertrophy.

Estrogenic material is specific in the treatment of the menopause. Subjective changes should be checked by observation of the vaginal smear. A new synthetic compound, diethylstilboestrol, possesses the advantages of being effective by mouth and very inexpensive. Nausea, vomiting, headache and possibly liver damage are associated with its administration in some cases. It offers interesting possibilities, but its status is still to be worked out.

Most pituitary disorders occur before the age of sixty, but they may occur after this age. Cushing's description of pituitary basophilism has stimulated speculation on the relation between the basophile cells in the pituitary and hypertension. Both increase with age, but there does not appear to be any statistical correlation between them.

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Medical Clinics of North America
January, 1940. Chicago Number

CLINIC OF DR. ROLAND P. MACKAY

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THE PSYCHOSES OF OLD AGE

MENTAL deterioration is the most grievous infirmity of age. Physicians, frightened by the gloomy prognosis, have too often neglected the subject. A comprehensive treatise on the psychiatry of old age would include a fascinating group of minor neuroses of the aged, never mentioned in textbooks. It would also include those major psychoses of middle life which may persist into the later years, such as the mental decay of syphilis or alcoholism. Likewise, manic-depressive psychosis may occur at the involutional period or continue after it. In the present discussion, however, we shall consider only those forms of insanity which are peculiar to advanced years, and which may therefore properly be called the psychoses of old age.

For our purposes, we may group these psychoses into four classes, as follows:

1. The senile psychoses proper.
2. Psychoses with cerebral arteriosclerosis.
3. Alzheimer's presenile dementia.
4. Pick's circumscribed cortical atrophy.

The senile psychoses are commonly thought to be due to the gradual wearing out of the brain cells and the final victory of katabolic over anabolic processes. The question of etiology is, however, not so easily dismissed, since the great differences which individuals show in their resistance to wear and tear suggest that innate toughness and vitality of neural structures play a most important rôle. The chemical or biological nature of this neural vitality has eluded all speculation. Arteriosclerosis, either of the decrescent or hypertensive type, undoubtedly hastens the process of senility in many brains, and is often so important a cause of mental deterioration that we speak of

"arteriosclerotic dementia." The senile and arteriosclerotic types of dementia can rarely be clearly separated clinically, and they are often combined in the same patient. Alzheimer's presenile dementia and Pick's circumscribed cortical atrophy appear to be more or less specific diseases, but the specificity relates largely to the pathologic characteristics rather than to clinical features.

In all four of these types of psychoses deterioration is seen in three fields: (1) physical, (2) intellectual and (3) emotional.

The *physical* dilapidation which occurs in old age is familiar to us all, and includes the general weakness and loss of muscular efficiency, the deterioration of skills, the loss of the acuteness of the special senses, the disappearance of subcutaneous fat and the wrinkling and inelasticity of the skin, the various deformities of the bony skeleton, the reduction of cardiovascular efficiency, and the numerous specific "degenerative diseases." To these are frequently added focal neurologic disturbances in the form of various paralyses, aphasias, tremors, or convulsions.

Intellectual enfeeblement is indicated by mental fatigability; poor concentration and attention; lack of memory, particularly for recent events; fabrication of false memories; discontinuity of thought and deterioration of judgment, leading eventually to confusional and delirioid states; failure of orientation; and finally, stupor and coma.

Emotional impairment is first seen in apathy and lack of interest and initiative; or in an exaggeration of desire strikingly out of proportion to impotence in its gratification. Ethical deterioration may lead to serious behavior disturbances, or simply to a callous disregard for propriety. Suspicion of loved ones is common. Various anxieties and depressions may alternate with paranoid and other delusional states, while a form of emotional incontinence gives rise to so-called pathologic laughing and crying. Some patients become by turns violent or sullen, passionate in their unwarranted hates and prejudices, subject to unpredictable vagaries of desire and impulse. On the other hand, the process may lead merely to pathetic childishness and a puerile interest in trifles. Insight may be quite lacking, or may vary from time to time. It is

probable that the characteristics of the emotional disorders in a given case represent an exaggeration of personality traits formerly present but under control. Thus the aged psychotic becomes a grotesque caricature of his former self, rendered futile and enfeebled by his intellectual decay.

The senile psychoses proper are sometimes divided into sub-groups according to their outstanding clinical features, such as *simple deterioration, presbyophrenia* (with marked defects of memory and orientation, but with some alertness and superficial adjustability), and *confusional, agitated, depressed,* or *paranoid* types. In the arteriosclerotic forms of dementia practically the same varieties may be seen. The onset in the true senile states is more gradual than in the arteriosclerotic types, the course is more evenly progressive, without remissions or exacerbations, while focal neurologic signs (such as paralyses or aphasias) are less apt to be encountered. Signs of focal neurologic involvement suggest a vascular component in the disease process, as do the abrupt onset and the remittent course, particularly when advanced arteriosclerosis is present in other parts of the body. In Alzheimer's disease, however, beginning somewhat earlier than arteriosclerotic or senile dementia, one frequently sees paralyses, aphasias, or convulsions in the absence of vascular disease.

In the following cases psychoses due to senility and arteriosclerosis are illustrated. Short paragraphs are added to describe the changes seen in Alzheimer's disease and in Pick's circumscribed cortical atrophy.

SENILE DEMENTIA

Case I.—W. V. M., a white man sixty-five years old, was admitted to the Psychiatric Institute in the Illinois Research and Educational Hospital on November 2, 1933, because of psychotic behavior. He was a native-born American, described by his friends as having always been kind, considerate, sociable, and always happy and enthusiastic. He had never had significant illnesses, and except for a minor head injury in 1923 (age fifty-five), he had worked since the age of twenty in the same glass factory and had been a good workman. He was married and had an adult son.

In 1928, when sixty years old, his illness began very grad-

ually with undue anxiety for the safety of his wife. He feared she would have a "stroke"; he followed her out of the house when she went on errands and inquired of the neighbors when he could not immediately find her. He held tightly to her when they were out together. The quality of his work slowly deteriorated and, two years later, he was dismissed for inefficiency. About this time (1930) he lost his life savings of $1000 in the economic depression. He became greatly depressed over these misfortunes, but refused to leave his wife to accept a position offered him in another town.

Thereafter he rapidly deteriorated both intellectually and emotionally. The intellectual impairment was evidenced by progressive failure of his memory and of his sense of size, time and space, and a general defect of judgment. For example: Asked by his wife to gather peas in the garden for dinner, he returned after an hour with less than a spoonful. Again, as deacon in the church he would assign so many ushers to the same aisle, leaving others unattended, and made so many other blunders, that his wife asked that he be relieved of his duties as deacon. He would also speak loudly in church and could not be quieted. In helping his wife at home he would leave floor sweepings in the middle of the room. Eventually he became unable to dress himself, would put his arms in his trouser-legs or lose his clothes entirely. He was finally unable to fulfill his personal needs, to distinguish day from night, or to find his way to the grocery store which had been next door for twenty-five years.

The emotional deterioration which accompanied this intellectual decline was shown by a gradual loss of interest in life, a relaxation of personal scruples, and a form of emotional incontinence. For example: He gradually lost interest in his wife, about whom he had previously been so solicitous, and exhibited little emotion when in 1932 she had the "stroke" which he had so feared. He became more irritable, cared nothing for his personal appearance, and developed marked stubbornness. He cried without adequate reason.

Examination.—Upon admission to the hospital the physical and neurologic examinations revealed no definite abnormalities. Reflexes, motor power and sensation were essentially normal. Blood counts, urinalysis, a blood Wassermann test and spinal

fluid examinations also gave normal results. The blood pressure was 134/84 and the degree of arteriosclerosis in the peripheral vessels was very slight.

During the six months of his stay in the hospital he exhibited a steady intellectual and emotional deterioration. At first he adjusted himself partially to the routine of the ward. He came at the proper time for his tooth-paste and ate carefully at meals, but he was always confused about dressing. During most of the time he sat about and did nothing. He never finished what he started; he interrupted the conversation of others but was not aggressive. After two weeks of daily instruction he could not fold his bedclothes. He was oriented as to his own person but frequently not as to others. Soon after admission he became unable to find his place at the table and had to be led to it. He was disoriented as to time, and always gave his birth year, 1868, when asked the date. His memory was faulty and he confabulated freely. He could never remember whether he had eaten breakfast or not; he recalled shaving when he had not done so, or insisted he had taken walks or received flowers although he had not. He forgot the names of doctors repeatedly presented to him, could not calculate correctly, and could be induced to say almost anything by simple suggestion.

Emotionally, he was usually neutral; he smiled rarely, cried occasionally. Yet he reacted vigorously to the surroundings when he understood them. For instance, when another patient attempted to take marbles from a nurse, he leaped up, seized a chair and shouted, "Now you leave her alone!" He tried to take charge of another patient, led him about or tried to push him into a seat, and shouted at him if he did not obey. Once he cried while sitting by this patient. Asked why, he replied, "You are all so nice to him, and he doesn't appreciate it. Just now he told me to go to hell. He should be ashamed!" He was frequently teased by the other patients, who told him his wife had been out with another man, or that he resembled a prominent financier currently in disrepute. To these taunts he shouted angry denials and struck at his tormenters. He lost his social sense, and forgot or ignored rules of decorum. When a dance was given for the patients, he shuffled a few steps with a nurse, but was unsuccessful. When confetti was thrown

playfully, he yelled in anger. On frequent occasions he urinated on the radiator and then denied it. Once he urinated on the ward floor and then went into the toilet and flushed the bowl. His emotional reactions were inappropriate. Once when his son visited him he cried, and walked to and fro with tears rolling down his cheeks and could not be quieted. Finally stopping, he introduced his son to every patient on the ward. Sobbing again, he said, "You are the finest son in Kokomo. I want everybody to meet you." His stream of thought was meager, his sentences formally correct though often false in content. Once or twice hallucinations occurred, to which he reacted by screaming and shouting. Eventually he became incontinent and totally untidy.

Comment.—In this patient we see steadily progressive intellectual and emotional deterioration with loss of social abilities, scruples and tabus, leading eventually to complete dementia, helplessness and incontinence. There were no remissions or exacerbations, no evidence of vascular or other organic disease adequate to explain his condition. There were never any evidences of focal neurologic disease, the process seemingly being diffuse. Symptomatically there was only simple dementia, without active delusional elaboration. Although a postmortem examination will be necessary to settle the final diagnosis, the best classification at present is unquestionably simple senile dementia.

PSYCHOSIS WITH CEREBRAL ARTERIOSCLEROSIS

Case II.—J. McG., an unmarried white woman seventy-one years old, was admitted to the Psychiatric Institute in the Research and Educational Hospital on January 10, 1934. She was born in Scotland to stable, religious parents. Her father had died at seventy-eight of pneumonia, her mother at sixty-three of "a stroke." She was one of twelve children, of whom seven had died in infancy.

The patient's health had always been good except for influenza in 1896. Although a bright student she finished only the grammar grades. She was always "shut in"; she never had a love affair or expressed any desire for marriage. Her sister said, "She was father's girl, and was content to look after him until his death." She was retiring, shy, scarcely speaking un-

less spoken to. All her life she had been careless of her personal appearance and was said to have no sense of humor. She was deeply grieved when her mother died in 1902, and even more so at the death of her father seven years later. Shortly after this time, when she was forty-six years old, she had a "nervous breakdown" which lasted several years. She became more seclusive, stopped going out entirely, and began to have somatic delusions. For example, she thought that she had no feet, or that there was a hole in the back of her neck. She was depressed and made two attempts at suicide.

In July, 1909 she was admitted to Kankakee State Hospital where she remained seven years. During this psychosis she was consistently depressed, and at times disoriented, agitated, or untidy, even urinating on the floor. She believed she had killed herself, that she had let all her body go until there was nothing left. Asked why, she answered, "I am, I am, I am, I am." The institutional diagnosis was "involutional melancholia."

Improvement was very slow and seemed never quite complete even when she was allowed to go home in February 1916. There she lived with two unmarried brothers and remained in general quiet and cooperative, although she refused to go out and left it to her brothers to do all the shopping. She would sit by the hour and watch people pass the house. She seemed never to have recovered entirely from her mental breakdown, but managed fairly well until early in 1934, when she began to be incoherent, amnesic and restless, and was finally committed.

Examination in Hospital.—Physically, the patient was emaciated and weak. She had arterial hypertension and sclerosis, and a "mitral lesion." The heart and aorta were enlarged and the electrocardiogram showed evidences of an impaired myocardium and coronary occlusion. Cytologic studies upon the blood gave normal results, as did urinalysis and blood chemical investigations. Microscopic study of the vessels of the nail fold revealed spasm and arteriosclerosis, the basal metabolic rate was —4, and the cerebrospinal fluid was normal. When first admitted she was kept in bed because of her arterial hypertension; later she became bedfast because of her physical deterioration.

Intellectually, she was observant but considerably confused

and had difficulty in following instructions and finding her own bed or place at the table. She had to be dressed because of her tendencies to make errors, such as putting her stockings over her shoes, or her gown on upside down. At meals she was noisy, spilled food, ate in improper sequence, mixed the various foods, or ate with her fingers. She could not make her bed or undress when told to retire, and was apt to get into bed with her underwear or shoes on. As time went on, she became more and more disoriented, amnesic, and confabulatory. Once she called a female physician her husband. She would claim her brother had visited her the day before when he had not, or say she had gone for a walk with a girl who was not present. She spoke of Queen Victoria's funeral as a current event. Occasionally she seemed to be hallucinated, as when she laughed at an imaginary cat she saw on the floor. Her memory for remote events was good, for recent events poor, but eventually she lost all memory. She could not do simple arithmetic problems like giving carfare change.

Emotionally she deteriorated in the same fashion. She showed few esthetic tendencies, was untidy, unkempt and unclean. Yet she was easily irritated, answered absurd questions with "I'm no dummy," and objected to staying in bed. She had frequent outbreaks of temper with swearing and became very angry over her own forgetfulness. At times she showed sympathy for nurses and attendants, but often was unfeeling and inconsiderate, as when she said of a patient who was noisy, "Let her die!" She became finicky about her food, although unaware of what she ate. For example, having refused to eat "hash," she ate readily when told the food was "meat." She showed considerable interest in the male physicians. If a doctor mussed her hair she was pleased, but became angry when a nurse did the same thing. Occasionally she started notes to one of the doctors, but refrained lest he think she was "running after him." She never bathed spontaneously; she had to be given special calls to the bath and then usually failed to secure towel and soap. If allowed to bathe herself, she cleansed only a single area and would then climb from the tub. She never requested changes of clothing. Her chief moods were irritation, anger and bitterness, but at times she was playful.

Course.—Her intellectual and emotional decline went hand

in hand, until she became bedfast, incontinent, and completely demented. Her death occurred June 10, 1936 of renal failure and uremia.

At necropsy there was marked generalized arteriosclerosis, including the vessels of the heart, kidney and brain, with myocardial degeneration, small contracted kidneys, and multiple areas of encephalomalacia. The cerebral convolutions were atrophic, and some cystic areas were found in the softened regions.

Comment.—In this patient the complex nature of the mental changes and their progress throughout her life make it difficult to evaluate all etiologic factors. She was a "peculiar" person from early life, with emotional characteristics sometimes seen in early schizoid states. She suffered a "nervous breakdown" after her father's death and at her own menopause, but this was not a pure depression, and the disorientation, somatic delusions and intellectual and emotional deterioration strongly suggest organic brain disease although there was some (incomplete) recovery. Her final psychosis was of closely similar sort, with perhaps less depression and delusion but more final dementia. The postmortem findings amply verified the clinical diagnosis of arteriosclerotic dementia, but the clinical features of the case point strongly to other, more subtle personality factors which were evident in the patient's early life as well as in the final psychosis. It seems best to consider the case one of arteriosclerotic dementia, with the reservation that many features of the illness were attributable to emotional and personal traits which antedated the arteriosclerosis and were a part of the patient's unique constitution.

ALZHEIMER'S DISEASE

In 1906 Alzheimer described a form of premature senile dementia which now bears his name. As implied above, there is little clinically specific about this condition to distinguish it from the usual senile dementia. It begins somewhat earlier in life however (at about fifty years). is rather rapidly progressive (lasting about three or four years), and is characterized by numerous signs of focal neurologic disease. Among these last are paralyses, aphasia, apraxia, convulsions or tremors.

In addition the usual picture of senile dementia is present: intellectual deterioration with memory defect, disorientation, confusion, impairment of judgment, and emotional decay with apathy, restlessness, pathologic laughing or crying, or delusions and hallucinations.

Alzheimer's "disease" can scarcely be diagnosed with assurance; clinically, it resembles arteriosclerotic rather than senile dementia, but the differences are only a matter of degree. The pathologic characteristics of Alzheimer's disease—intracellular fibrils in the cortical ganglion cells, neuronal atrophy, neuroglial proliferation and the formation of "plaques"—were once thought specific, but they have been found in less striking degree in cases of arteriosclerosis, syphilis, and encephalitis.

It seems, therefore, that this condition is not truly a "disease" but represents rather a clinico-pathologic syndrome which is unique only in the aggregate of all its features.

PICK'S DISEASE

Like Alzheimer's disease, this condition is also considered an early or presenile form of dementia. It was described in 1892, some fourteen years earlier than Alzheimer's disease, and is much rarer in occurrence, since only about eighty cases have ever been described.

Its onset is somewhat later than that in Alzheimer's disease; it is said to occur more commonly in women, and its progression is rather slow, although perhaps rapid at first. Emotional dulness appears first, with loss of initiative, ethical sense and mental productivity. Intellectual enfeeblement is steadily progressive, except that memory is said to be relatively well preserved. Signs of focal neurologic disease are not so strikingly present as in Alzheimer's disease, but aphasia, apraxia and agraphia are common. Dementia eventually becomes extreme and physical dilapidation advanced, the patient finally becoming incontinent, mute, cachectic and vegetative. Death occurs in five to ten years. Pathologically, the cerebral cortex is the site of a rather diffuse atrophy, which is especially marked in certain bilaterally symmetrical areas, particularly in the frontal and temporal lobes. There is degeneration of ganglion cells, proliferation of glia, and aggregations of fat-bearing phagocytes of glial origin.

Differentiation clinically from other forms of dementia seen in old age is very difficult. Memory is relatively preserved, and delusions, hallucinations and confabulation are less frequent than in Alzheimer's disease. Encephalographic studies in cases of Pick's disease reveal some internal hydrocephalus and focal collections of air over the cortex. There is no certain diagnostic criterion whereby the disease can be recognized.

PROGNOSIS AND TREATMENT

The psychoses of old age, closely resembling one another in their clinical appearances, have a uniformly unfavorable prognosis. Since no method has been discovered for delaying the process of senescence, the senile and arteriosclerotic forms of dementia naturally do not lend themselves to successful treatment. Neither has a satisfactory method been devised for the treatment of Alzheimer's or Pick's disease. Certain measures are nevertheless necessary in the management of such patients, irrespective of the prognosis, and these should be carefully considered.

It is in the early stages of the psychoses of old age that serious errors of judgment are apt to be committed, before the patient's increasing irresponsibility has been recognized. For example, early paranoid ideas may lead to the unwarranted and unjust alteration of a will; or poor judgment may lead to unwise financial investments, carelessness in the management of property, or the wasting of resources. Later, various hostile attitudes may threaten even the lives of relatives or associates. Sexual crimes are not infrequent when the irritable passions of the senile patient are poorly controlled by reduced inhibitions.

Early diagnosis is therefore the first important requisite in the management of such patients, for the protection of both the patient and his relatives. Unfortunately, medical advice is often not sought until late in the disease, because of the inability or unwillingness of relatives to see anything wrong in the patient's behavior at an early stage.

Most patients with the dementia of age can be managed for a long time at home, possibly with the help of a maid or companion. Such an arrangement is usually much to be preferred to institutionalization so long as it is at all possible. In most cases, however, it becomes ultimately necessary to place the

patient in a suitable hospital, where, under stereotyped routine, many patients will make a very satisfactory adjustment.

Of course no medications will alter the inevitable course of all these conditions. *Sedatives are to be avoided* as much as possible, because they tend to confuse and befuddle even normal people and are especially confusing to those already upset. Elderly persons react more violently to drugs than younger adults. Often sedative baths, warm drinks at bedtime, and judiciously chosen and interesting activities serve the purpose much better. If sedatives are imperative, the more rapidly acting barbiturates are perhaps best. They must be used cautiously, however, and especially in the aged.

A well-balanced diet, plus adequate amounts of vitamin B, should be supplied. Alcohol is especially contraindicated, except that sometimes small amounts of ale or beer serve as excellent appetizers. Whatever the details of management found necessary, infinite patience and tact are indispensable and a proper regard for the idiosyncrasies and individual peculiarities of these old people. An understanding sympathy and respect must accompany all forms of treatment, and will serve to smooth the pathway for patients whose mental and physical course is inevitably downward.

Note.—The author expresses his appreciation to Dr. A. A. Low, of the Psychiatric Institute, through whose courtesy these cases were made available for presentation.

Medical Clinics of North America
January, 1940. Chicago Number

CLINIC OF DR. ROBERT W. KEETON

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TREATMENT OF THE SENILE DIABETIC

IT is a little difficult to know when senility begins. The medical man realizes that its onset is not marked solely by the flight of time. Physiologically it appears when degenerative changes have limited the individual's physical activities and lessened or abolished his sex life. Pathologically its onset is visualized in extensive arteriosclerotic changes which make impossible an adequate distribution of blood and oxygen to the tissues.

Joslin[1] has reported that the maximum age of susceptibility to the onset of diabetes is fifty-one for males and fifty-five for females. In the seventh and eighth decades there is a striking decline in susceptibility, so that he concludes that "diabetes is not an old age disease." The frequent association of arteriosclerosis with diabetes in the middle-aged and elderly patients is common knowledge to all physicians. As a cause of death of the diabetic, arteriosclerosis has risen threefold (Joslin), even though the newer methods of treatment have postponed the appearance of premature arteriosclerosis. We must conclude that the arteriosclerotic diabetic should be classified as senile or potentially senile even though his age and apparent vigor would indicate otherwise. It would seem important, therefore, to examine carefully many of the problems presented by him.

ABILITY TO OXIDIZE GLUCOSE

Perhaps this subject can best be presented by two cases:

Case I.—A man, fifty-two years of age, has been living on an unrestricted diet. He developed some frequency and burning on urination. The urine contained 4 plus sugar. The

blood pressure was 170/80 and there was a slight increase in light reflex of his retinal arteries. His radial blood vessels were normal on palpation, but an accentuated second aortic sound was heard. The electrocardiogram showed left ventricular preponderance and slurring of the QRS complex in all leads. The patient was obviously an arteriosclerotic diabetic who wished to be desugarized by diet adjustment. He was placed on a diet containing 2200 calories, which was his maintenance requirements. It was expected that by gradually lowering his carbohydrate and increasing his fat so as to maintain his caloric intake, he would be desugarized. The clinical course of the case is summarized in the tabulation.

TABULATION

RESPONSE OF AN ARTERIOSCLEROTIC DIABETIC TO LOWERING OF GLUCOSE INTAKE

Glucose intake, in gm.*	Urinary.		Glucose oxidized, in gm.
	Sugar, in gm.	Acetone.	
175	30.0	0	145.0
150	25.0	0	125.0
100	18.0	Trace	82.0
85	15 0	+	70.0
60	10.0	+++	50.0

* The figures in the tabulation represent averages of three days' observation.

It was obvious that a reduction in glucose would not desugarize this patient. It was further clear that an increased quantity of glucose in the diet facilitated its oxidation. It seemed that the larger quantities of glucose exerted a great oxidation pressure on the cells. This situation was summarized by the older clinicians in the pre-insulin days in the advice that the elderly diabetic does poorly on a rigidly restricted diet.

Case II.—A relatively obese woman weighing 200 pounds, 5 feet 10 inches tall and forty-five years of age, entered the hospital complaining of pain, tingling sensations, coldness and

discoloration of the fourth and fifth toes of the left foot. She had been a known diabetic for four years, but had not followed an exact management. Her blood pressure was 190/90. The urine contained large quantities of sugar but no acetone.

We were dealing here with a diabetic patient who was obese and who had severe embarrassment to blood flow through the left foot. She refused to take insulin, so desugarization was accomplished by diet adjustment.

Period of Hospitalization:

12/ 5/38: Entered hospital.

12/ 6/38: Blood sugar, 238 mg. Urine contained in all specimens 4 plus sugar. Diet contained 142 gm. of glucose, 1630 calories.

12/ 9/38: Blood sugar, 192 mg. Urine still contained large quantities of sugar. Diet reduced to 132 gm. of glucose, 1234 calories.

12/12/38: Blood sugar, 263 mg. Urine contained sugar 2 plus, no acetone. Diet further reduced to 100 gm. of glucose, calories 1098.

12/15/38: Blood sugar, 222 mg. Urine contained sugar +, no acetone.

The patient decided to follow a diet rigidly at home rather than take insulin. It seemed unwise to reduce the glucose value of the diet further. It was hoped that a gradual desugarization would be accomplished in time.

Subsequent Period of Observation:

1/ 7/39: Blood sugar, 235. Urine showed sugar before lunch, but the specimens before breakfast, dinner, and at bed time were sugar free. Weight 191¾ lbs., blood pressure 175/85. Diet readjusted to contain 106 gm. of glucose and 1162 calories.

1/21/39: Urine was sugar free, weight 189½ lbs., blood pressure 172/90. Diet adjusted to contain glucose 113 gm., calories 1196.

2/ 4/39: Blood sugar 277, weight 185½ lbs., blood pressure 178/95. Diet remained the same.

3/18/39: Blood sugar 238, weight 178½ lbs., blood pressure 160/90. Diet: glucose 151, calories 1269.

5/ 6/39: Blood sugar 208 mg., weight 169¾ lbs., blood pressure 176/90. Diet: glucose 169, calories 1611.
6/24/39: Blood sugar 189 mg., weight 166½ lbs., blood pressure 138/85. Diet remained unchanged.

From a study of the protocol it can be seen that the patient was gradually desugarized with a high blood sugar and at first accepted additions of glucose to the diet without increasing the glycosuria. Over a period of six months she has gradually improved, and has oxidized increasing quantities of sugar without a return of the glycosuria. However, this has been accomplished at fasting blood sugar levels which exceed definitely the glycosuric level for normal individuals. The behavior of cases of this type is familiar to clinicians who treat appreciable numbers of diabetics. The significance of this reaction is not, however, so thoroughly appreciated and it is for this reason that the subject is brought to your attention.

Woodyatt[2] in 1924 called attention to this response in "Elderly Persons with Arteriosclerosis." He showed that the glucose in the diet could be increased significantly without the extra glucose appearing quantitatively in the urine. They are to be sharply contrasted with younger individuals in whom, once the glycosuric level is reached, glucose added to the diet appears quantitatively in the urine. He also noted that in these cases a given dose of insulin often exerted a disappointing effect on the glycosuria. Here again the quantitative relationships failed to manifest themselves. It was suggested that in the arteriosclerotic patient there were modifying factors in the tissues or cells which influenced the action of insulin. An analogy was seen in the loss of insulin activity in patients suffering from acidosis and infection. This distinction between the behavior of diabetic patients has continued to attract attention,[3] with the result that they have been divided into two groups: (1) those sensitive to insulin, and (2) those insensitive to insulin.

If the isolated normal dog's heart be subjected in an oxygenator circuit to varying concentrations of glucose, within certain critical levels the utilization of the glucose varies with the elevation of the glucose level.[4] Thus if the level of glucose is increased to that seen in many diabetic patients, the utiliza-

tion is doubled. If insulin is added when the sugar level is low or normal, the utilization will again be increased. These results are in agreement with those recorded by many other workers.[5] If the diabetic heart is robbed of insulin from all sources, then the utilization of glucose drops to a minimal quantity[6]; with the addition of insulin this power is restored, and it acts very much like the normal heart, being responsive to elevations in blood sugar levels.

Soskin[7] has extended these studies to the eviscerated dog and he has reached the conclusion that if the diabetic dog's blood sugar is maintained at a high level, he will oxidize glucose at approximately the same rate as the normal dog will at lower levels. There may be some question as to whether Soskin's diabetic animals were entirely deprived of all their insulin, but for our purposes this is not important. If a reduced amount of insulin were still available in his experimental conditions, the similarity to conditions existing in arteriosclerotic diabetic patients would be striking. It would seem, therefore, that there is very good evidence to regard the blood sugar elevation as a physiologic adjustment designed to meet the diabetic defect in those patients.

OBJECTIVES IN MANAGEMENT

It is now evident that there are two problems presented by these patients:

1. How much glucose is he burning? Is the quantity adequate? Is the quantity optimal?
2. At what blood sugar level are his oxidations proceeding?

Quantity of Glucose Oxidized.—This is the fundamental problem with the diabetic. Upon it his life depends. When it drops low, acidosis supervenes; when it is inadequate, other problems arise. If the patient is active and going about his daily occupations, there is rarely any danger of the physician's restricting his glucose intake too sharply. The appetite under the guidance of energy requirements will usually force an adjustment. If the patient is in bed because of illness or some surgical emergency, the danger may be a very real one. It is a safe rule to see that such patients have an opportunity of burning 150 gm. of glucose per day. This quantity should be distributed throughout the twenty-four hours.

It is much more difficult to set up standards for the apparently healthy individual. We at once run into two schools of thought: (1) those that believe a moderately liberal quantity should be given, and (2) those who have stressed the advantages of the high carbohydrate diets. The more liberal use of carbohydrates has been practiced by all, and this has been done with the hope that the oxidation of the glucose will prevent the development of arteriosclerosis. A diet more liberal in carbohydrate is more readily obtainable and takes away from the patient the stigma of isolation for dietary reasons.

Regulation of Blood Sugar Levels in Apparently Healthy Patients.—It is a common experience to have arteriosclerotic diabetic patients, otherwise apparently healthy, seek advice because they have an elevated blood sugar, with or without minimal quantities of sugar in the urine. To use their language "they have sugar in blood but not in the urine." They may recall some member of the family who had a mild diabetes and gave it very little attention until he developed gangrene. Their family physician, who discovered the high blood sugar, may have impressed on him that he was very sick and in great danger unless he was immediately treated.

From what has been said it is obvious that such patients may not be in any immediate danger and they may live a very useful and efficient life for a number of years without changing their dietary habits. This, however, is not the real problem involved. The difficulty with accepting this "laissez faire" attitude lies in the pitfalls to which the diabetic is subject. An infection, an accident, or an emotional upset may change his diabetes from the relatively benign into the severe malignant type which kills. He needs to be educated in all the vagaries of the disease and to be trained in the methods for protecting himself. Above all other things he should be taught the use of insulin.

The question with which the patient is immediately concerned is whether he should start insulin at once or begin it when trouble appears. When he is given two doses of regular insulin, one before breakfast and one before dinner, the fasting blood sugar may not be reduced. It usually remains high. If this is to be influenced, a bed time dose of insulin must be given. To the physician and the patient this appears a rather

futile procedure. The patient is put to a great deal of inconvenience to remove 10 gm. of sugar from the urine and to lower the fasting sugar level from 210 mg. to 170 mg. Hence there is little incentive to use the regular insulin except as a means of desugarizing the urine and augmenting the patient's tolerance during periods of depression.

The story is quite different when protamine insulin is used. Often a quite small dose, 8, 10 or 15 units, may reduce in a few days' time a blood sugar from 285 or 300 to 150 or 130 mg. With this reduction in blood sugar there is a definite change in the appearance of the individual, the texture of the skin, and subcutaneous tissues. The superficial vessels become more apparent and the waxy shiny appearance of the skin disappears. The subcutaneous tissues become less tight and bind the skin less closely to the muscles. In short they return to a more normal state. I think we can hardly escape the obligation of teaching all diabetics that they should be educated in the use of insulin so that it will be available when needed, and so that they can be returned to this more normal state.

Patients Severely Sick.—There is a feeling among a few surgeons that convalescence from a surgical procedure, especially one complicated by an infection, is retarded by an elevated blood sugar. If the infection spreads and gains the upper hand in the battle, the toxins depress the patient's tolerance and the diabetes becomes worse. The blood sugar readings become progressively higher despite the use of increasing quantities of insulin. So the poor showing of the patient is easily attributed to the elevated blood sugar. When one is dealing with a fulminating infection, it is difficult to know on which factor (diabetes or infection) the blame should be placed. However, if one examines wound healing in the absence of infection, or if one examines the clinical behavior of the patient in the presence of less virulent infections, the problem is clear.

In the management of postoperative diabetic patients in the Research Hospital certain general principles have been followed:

1. Sufficient glucose and insulin are administered to support the patient's metabolism. Stress is placed on the quantity of glucose burned. If acetone bodies appear in the urine, the quantity of glucose being oxidized is obviously inadequate.

2. No attempt is made to keep the urine clearly sugar free. Excess quantities of sugar indicate the need for more insulin.

3. The urine output should be 1000 cc. or more.

4. The tongue should be kept moist.

5. A fasting blood sugar around 200 mg. or less is considered satisfactory.

When these conditions are met there is no problem with postoperative convalescence. Our patients have been operated on for all types of surgical conditions. We have had an unusually large series of cataract operations. The convalescence has been quite as satisfactory in the diabetics as in the non-diabetics. When patients with non-surgical infections like pneumonia, erysipelas, and upper respiratory infections have been similarly treated, their recovery also has been satisfactory. It would seem that if the conditions for normal hydration of the tissues and transport of water across the membranes are maintained and adequate quantities of glucose are burned to maintain metabolism, the diabetic state does not prevent wound healing or abolish resistance to infection.

The Hypoglycemic Reaction in the Arteriosclerotic Patient.—Considerable evidence is in the diabetic literature[8] indicating the serious effect on the arteriosclerotic heart of the hypoglycemic reaction induced by insulin. Changes in the S. T. segment, inversion of T waves, and conduction deformities were noted in experimentally induced insulin shock. Anginal attacks have been noted in patients receiving insulin. Coronary thrombosis has occurred in four patients after a rapid fall in blood sugar.[9]

When the deleterious effects of reactions on the arteriosclerotic heart were first known, many physicians advised against the use of insulin and insisted that such patients be treated by diet adjustment alone. At present, however, physicians are convinced of the importance of using insulin, but they are very certain that extreme care should be used to avoid reactions. At times we experience considerable difficulty in detecting a reaction. One would think that this should be a relatively simple task. This is true in the average case which is insulin sensitive and has a quantitative glucose response, but it is quite puzzling in the group under discussion. When an arteriosclerotic patient receiving insulin begins to show unusual

symptoms, a reaction should be suspected. A few illustrations will be cited:

A woman, sixty-seven years of age, receiving before breakfast 36 units of protamine and 15 units of regular insulin, and before dinner, 10 units of regular insulin, runs sugar in all specimens passed. She eats her dinner at 7 P. M.; at 10.30 P. M. she is nauseated on two nights and on the third night vomits. A feeding of milk given at 9.45 P. M. abolished the nausea and presumably prevented the reaction of which the nausea was a symptom. On two other occasions in the course of a long illness the same patient was wakened out of a sound sleep between 10 and 11 P. M. with a bout of paroxysmal auricular fibrillation. In the light of the previous experience it is hard to escape the conclusion that these attacks were precipitated by insulin reactions.

A male patient, fifty-three years of age, showed an excretion of 8 gm. of sugar in 1500 cc. of urine and a fasting blood sugar of 210 mg. His diet remained unchanged, his dose of protamine insulin was raised from 30 to 35 units, and his regular insulin from 15 to 20 units. The urine desugarized, but it increased in quantity to 3200 cc. Simultaneously with this, the patient felt weak and uncomfortable. In another instance a woman was receiving protamine and regular insulin before breakfast and a dose of regular insulin before dinner. Since she did not desugarize it was decided to give her a small dose of regular insulin before lunch. In the hours between 1 P. M. and 7 P. M. her customary output was 300 to 350 cc. On the day of the extra insulin, the quantity of urine during the same period rose to 1200 cc., and each specimen contained sugar. At 5 P. M. the patient became so nervous and disturbed that 45 grains of sodium bromide was used as a sedative. I have come to regard these sudden increases in urine unassociated with acetone formation as a symptom of an insulin reaction. One should remember that even though the urine contains sugar, restlessness at night, inability to sleep, and unexplained periods of mental confusion may still be due to too much insulin.

I wish to make the point that the laboratory tests may fail at times to substantiate the existence of a condition which our clinical experience tells us must exist. Why should the arterio-

sclerotic patient be accused of having a hypoglycemic reaction when his blood sugar is not particularly low and his urine contains sugar? Attention has already been called to the transient effect on the blood sugar of doses of regular insulin. Such transient depressions of the blood sugar initiate the protective mobilization of glucose from the liver and the secretion of adrenalin. This response is often excessive, so that sufficient glucose is liberated to produce a glycosuria.

Such patients, then, when receiving excessive doses of insulin may be viewed as going through a series of transient reactions followed by recoveries in which excessive quantities of glucose are mobilized. One would have to view the recovery process as a stubborn one, which resisted valiantly any reduction in the blood sugar level. From this viewpoint one would have an explanation for the anomalous situation in which it is necessary to lower the dose of insulin in order to desugarize the patient.

THE PAINFUL GANGRENOUS FOOT

Case III.—This sixty-two-year-old white female was perfectly well until three years ago, when she began to lose weight slowly, became weak, and was easily fatigued. She urinated frequently both day and night. The urine contained sugar and a diagnosis of diabetes mellitus was made. On diet and insulin she desugarized and maintained herself in satisfactory state.

Four months ago, two years and nine months after the diagnosis of diabetes was made, pain appeared in the right foot. This pain was especially bad at night, and often she was unable to sleep. Within the last two weeks gangrene of the first three toes has appeared. The third toe has recently begun discharging and the ball of the foot has become swollen. The pain was so severe that opiates (morphine gr. ¼) had to be administered at four- to six-hour intervals. The *x*-ray plate of the foot showed only moderate calcification of the vessels. There was no osteomyelitis of the bones of the foot. The blood pressure was elevated (214/110). There was no history of anginal pain. The pulse was regular, the heart normal in size, and there was no decompensation. The radials were moderately sclerotic. The vessels of the eye grounds showed arterioscler-

osis (+++) and a few small glistening white plaques. Within twenty-four hours after admission the temperature rose and continued between 101 and 102° F. The pulse was increased correspondingly.

The medical problems presented by this clinical condition were grave and deserve most careful consideration. The patient had a moist gangrene which was extraordinarily painful. Three toes were involved and the circulation through the plantar arch was interrupted. This latter was evidenced by tenderness and swelling of the ball of the foot. The pain, however, was somewhat out of proportion to the degree of involvement of the foot. Severe pain preceded the onset of the gangrene. This symptomatology is of diagnostic significance when it is coupled with a blood pressure of 214/110. We are dealing with two processes here, a hypertensive senile arteriosclerosis which has been gradually reducing the blood flow through the extremity over a period of years, and a diabetes of two years and nine months' duration. The pain which preceded the gangrene was the result of the restriction in blood flow by the medial sclerosis. Then the thrombosis occurred, further restricting the blood flow and making the pain intolerable. This line of reasoning would lead one to the conclusion that there was little or no hope that a collateral circulation would reestablish blood flow through the toes. Since the plantar arch was involved, there was no hope that the process would be confined to the toes and result in mummification.

The moist character of the gangrene, by its swelling, caused additional pressure on the vessels and interfered further with the blood flow. The moisture in turn favored the growth of organisms and the development of sepsis. An excellent culture medium was provided for not only staphylococci and streptococci, but also for the gas-forming anaerobes. All of these have great invasive properties, and some of them may be recovered from the blood stream. The necrobiotic tissue which is rapidly undergoing autolysis develops toxins injurious to the patient. They reduce the carbohydrate tolerance, damage the kidneys, cause a retention of nitrogen, and often produce an uncontrollable diarrhea.

From a clinical viewpoint one must conclude that amputa-

tion is the only feasible treatment. The clinician should say to himself and his colleagues, that although this is the decision of choice, healing will be slow and recovery prolonged. With the extensive medial changes in the arterioles, no other result is to be expected. The patient, in turn, will demand that he be relieved of pain, but he will be equally insistent that the leg be saved. He will be unwilling to face the conclusion that amputation is inevitable. He will demand a new salve, a new type of heat lamp, or the application of a modern suction machine. The problem now shifts from the medical to the social field. It is, however, none the less the physician's responsibility. He must visualize clearly the emergency that exists and must apply sufficient pressure to obtain a consent for immediate amputation.

Under spinal anesthesia, a supracondylar amputation was performed in the above case according to the method of Callender on January 2, 1937. The temperature gradually subsided and the pulse slowed. The stump looked good for a week's time, then the drainage became more profuse and gangrene reappeared in the distal portions of the flap. Six weeks after the amputation the progress notes by the surgical resident showed the flaps of the stump to be gaping widely and the necrotic subcutaneous tissue beginning to separate. On March 5, three months after the operation, it was noted that the slough had as yet not completely separated, in spite of frequent irrigations with Dakin's solution, prolonged use of allantoin salve and excellent control of the diabetes. On April 20, 1937, four months and eighteen days after the amputation, the patient was discharged with instruction to irrigate the stump twice daily. *x*-Ray films of the stump showed some irregular decalcification in the femur but no evidence of an osteomyelitis.

Use of Heat Control Box.—This patient's life had been saved, but she still had a generalized arteriosclerosis to which she must adjust her life. Her specific complaints now were pains in both legs and an unhealed amputation stump. During all of her stay in the hospital she had been sleeping under a heat control box.

This is a box which is heated with electric lights and has a thermoregulator so that it can be set to any desired temperature. A blanket or quilt is spread over the box and the

patient. This keeps a uniform temperature from the waist line downward and the thermoregulator is usually set to maintain 90° F. Such boxes have been previously described by Starr and Sevringhaus. The device is extremely valuable in the management of patients with impaired circulation of the extremities. It maintains a steady heat as long as the patient is under the box. There should be no danger of burning the feet. If it becomes necessary to apply moist dressings, these too may be maintained at the desired temperature. When one has used this device, it is difficult to be deprived of it in the management of diabetic feet.

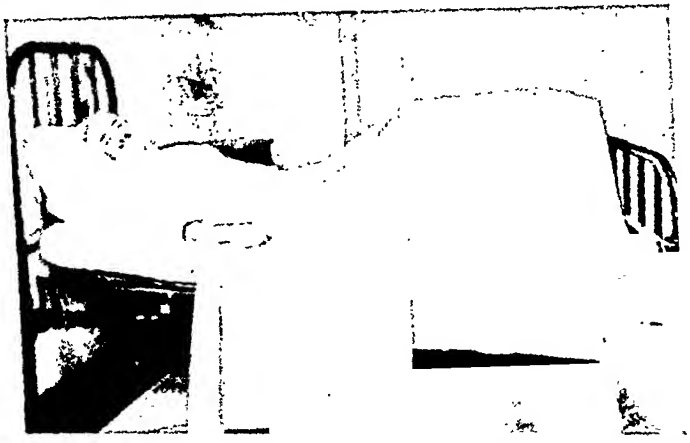

Fig. 15.—Patient in a heat control box covered with a quilt, maintaining a relatively constant temperature from the waist downward.

A great deal has been said as to the optimum temperature at which the extremities should be maintained. The average temperature beneath the clothes of a normal person is 90° F. However, when there is a vascular sclerosis this temperature will not as a rule be reached unless external heat is applied. The application of bed clothes and socks will not cause the desired dilatation. If the foot is swollen and engorged with blood and lymph, which is not moving satisfactorily, the application of more heat and the raising of the temperature to 98° F. or higher causes more swelling and engorgement and more stasis. Higher temperatures speed up the local oxidative processes, increasing autolysis and bacterial growth. With a

lowering of the temperature much below 90° F. the constrictive effect of the cool environment decreases the blood flow through the larger arteries and reduces the arterial head of pressure.

This patient purchased such a box and lived under it until she returned to the hospital on March 18, 1939, two years and fifty-one days after her last discharge. During that time the right stump had healed perfectly and the pains in the left leg had been controlled.

THE MECHANISM OF THE PRODUCTION OF GANGRENE

The problem of gangrene is an ever-present one with the senile diabetic. It may not actually be present today, but it is more or less potentially existent. The patient discussed above exhibited the senile arteriosclerotic changes which are present largely in the media of the vessels. Here calcification and actual bone formation occurs. The process is diffuse. It occurs in both the larger vessels and in the smaller collaterals. It gradually strangles the blood supply to the limb. When an occlusion occurs in moderately large vessels, the collaterals are entirely inadequate. Due to the medial changes they are incapable of dilating and establishing a compensatory blood supply. The blood flow ceases in the distal branches because, here, the head of pressure has dropped to zero and gangrene of the toes is inevitable.

The disconcerting and hopeless feature of the situation to the patient and his physician is the apparent absence of any precipitating cause for the gangrene. He can recall no accident or injury to his foot. The gangrene of necessity is preceded by pain, and its onset is marked by an exacerbation of the pain. The pain arises from the tissue ischemia and its severity becomes a measure of the ischemia. In these cases conservative treatment is obviously of little value. One should not feel chagrined at advising amputation because of severe pain. He is really advising an amputation because the blood supply to the extremity is already hopelessly inadequate, and because the sclerotic process is progressive and irreversible.

There are other clinical types of gangrene seen in diabetes which present a more hopeful picture, however, and for which much can be done. In these individuals the lesion follows an

accident. An infection follows the trimming of a corn or toe nails. A tight shoe pinches a toe. A heavy object is dropped on the foot or the individual steps on a nail or a tack. The gangrene may be quite painless unless the swelling due to the infection is great. Indeed, the patient is often surprised to find the toe discolored. He had noticed that it was numb and tingled somewhat, but to this he had attached no significance.

The fundamental pathology in these cases is different. Here we are dealing with changes which originated in the intima. These have led to lipoid infiltration and the deposition of cholesterol crystals. Later, calcification of the deposits has occurred with plaque formation. Necrosis of the overlying cells in turn has in some cases led to the formation of an atheromatous ulcer. These conditions predispose to thrombosis, but they do not prevent the development of collaterals. The constricting influence of the medial sclerosis is absent. Hence the collateral may continue to carry supplies of blood adequate to prevent tissue ischemia and hence pain.

It can be seen that if accidents and minor injuries are avoided, gangrene also may be avoided. If gangrene should occur, one can often preserve the leg by the use of conservative measures. Hence it is the duty of the physician to adopt these measures and advise amputation only after these have failed.

DIAGNOSTIC VALUE OF A PAROXYSM OF AURICULAR FIBRILLATION

On the return to the hospital of the patient described in (Case III) she gave the following story: She had been in comparatively good condition until two weeks previously. At that time generalized pains and aches came on suddenly and for no apparent reason. They were felt over the entire body, but they were especially severe in the amputated stump, left foot, arms, precordium and epigastrium. They lasted for fifteen to twenty minutes and were then relieved. All the pains would come and go at the same time. Since their onset she had been nauseated and had vomited several times each day. At another time she stated that she had no abdominal pain, but did experience pressure over the precordium. On cross questioning her, it was difficult to shake her story of the intense widespread character of the pains,

and the fact that they seemed to appear explosively and simultaneously in all the fields. The appetite had been poor since the onset of these pains. This was followed by nausea and during the last four to five days she had vomited irregularly.

The physical examination showed a moderate degree of dehydration and some diffuse abdominal tenderness but no rigidity. The heart presented no other findings than those previously noted. The blood pressure was 166/88. The blood sugar was 276 mg. The urine contained sugar and acetone. So the patient was considered to have a generalized arteriosclerosis and diabetes, and it was thought that she was out of balance. It was expected that a few days of accurate diabetic management would solve her problem. The pains were thought to be aggravated by the mild degree of dehydration; however, she continued to vomit. It was necessary to resort to intravenous fluids to maintain her water balance and glucose intake.

On March 6, five days after entrance, an auricular fibrillation appeared. At this point the true clinical picture began to clarify itself. She was cross-questioned more carefully as to the origin of the pain and its radiation. It then seemed that the pain was more often in the precordium or epigastrium than elsewhere. Hence the tentative diagnosis of "coronary thrombosis" was reached. Since the patient was vomiting, quinidine (grains ix) were given in a starch retention enema. Within eight hours the normal cardiac rhythm was restored and the blood pressure had risen to 204/94. Serial electrocardiograms on March 7, 10 and 17 were diagnostic of coronary occlusion (Fig. 16).

This episode proved to be an extremely instructive one from a diagnostic viewpoint. Although the patient described her pains accurately, the description was not accepted at its face value because she appeared to be neurotic and another plausible explanation (diabetic disbalance) was at hand. With the onset of fibrillation, one was led to restudy her story and to correct the diagnosis. The symptoms may now be more intelligently interpreted in retrospect. The wide radiations of the pains were severe, sharp, and periodic. Anginal pains also are severe, sharp and periodic. Hence the coronary pain apparently initiated these peripheral pains. One is familiar

with the intense spasm which occurs in the femoral artery when an embolus has landed in one of its branches. Hence with a coronary infarction there is no reason why a widespread vasospasm may not occur and be especially effective in those branches which are already narrowed by the arteriosclerotic process. The pains in the extremities were to be attributed to an ischemia rather than a neurosis.

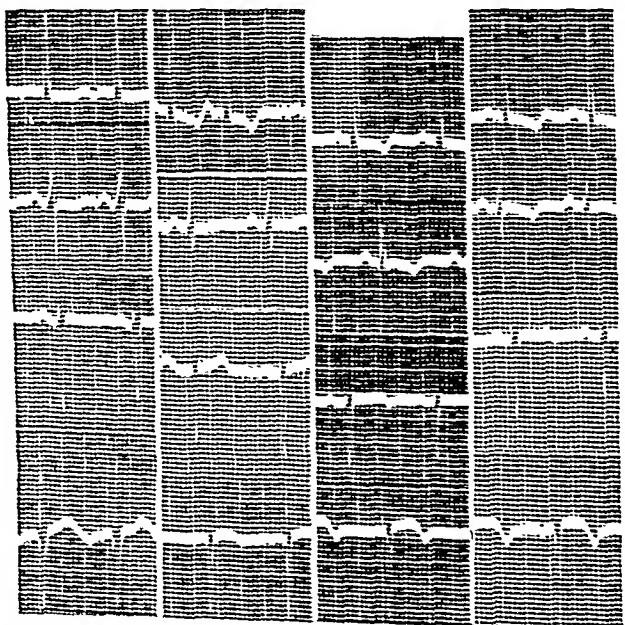

Fig. 16.—Several electrocardiographic tracings on Case III, March 7, 10, and 17.

It is therefore a safe rule to treat a paroxysm of fibrillation in a patient with arteriosclerotic heart disease as due to a coronary thrombosis until it is proven otherwise.

DISTURBANCES IN CALCIUM METABOLISM

Case IV.—A woman, age sixty-eight, known to be diabetic for twenty years and with a moderate hypertension (150/85) and arteriosclerosis, lived for a number of years on a somewhat restricted diet. She enjoyed rich foods and

became definitely obese (weight 215 pounds). She had used insulin since its introduction, but had not consistently maintained a sugar-free urine. The urine contained no albumin, the blood nitrogen values were normal, cholesterol was 171, calcium 10, and phosphorus 4 mg.

This patient has suffered over a period of years a fracture of the left humerus, right ankle, and several ribs. In all cases

Fig. 17.—Anteroposterior view of lumbar spine, showing collapse of second lumbar vertebra.

there was a definite trauma as the precipitating factor. *x*-Ray plates of the gallbladder showed a single large cholesterin stone. The left kidney also had a large stone in the pelvis. She had enjoyed what she characterized as "good health" during the fall of 1938. On the night of January 21, 1939 she was up to go to the bathroom and, on returning to bed,

she missed the bed and sat down heavily on the floor. An agonizing pain developed in the lumbar region, she stretched out on the floor, and was found in a state of shock. The skin was cold and covered with sweat. The heart was fibrillating. It was the clinical impression that she had suffered an injury to one of her vertebrae. When it was safe to move her some three weeks later the plate of her spine showed a collapse of the second lumbar vertebra. After ten weeks in bed, healing of the vertebra was complete (Fig. 17).

Fig. 17a.—Lateral view of lumbar spine, showing collapse of second lumbar vertebra.

Case V.—A woman, age sixty, with a diabetes of ten years' duration and a moderate degree of arteriosclerosis and hypertension, had always controlled her diabetes rigorously. Prior to using protamine insulin she had an elevated blood sugar, but her urine was sugar free. The urine was free of albumin and the blood nitrogen values were normal. She twisted her hip rather suddenly one day when her foot was caught in a rug. She did not fall. Following this she de-

veloped pain in the hip and difficulty in walking. The injury seemed so slight that she forgot about it. When the pain persisted, a diagnosis of rheumatism was made by her physician. After taking an *x*-ray the diagnosis was changed to fracture of the neck of the femur. This patient had had a large cholesterin stone removed from the gallbladder four years previously. The fracture healed satisfactorily when adequate orthopedic measures were applied.

Case VI.—A woman, seventy years of age, a known diabetic for twenty years with high blood pressure, arteriosclerotic

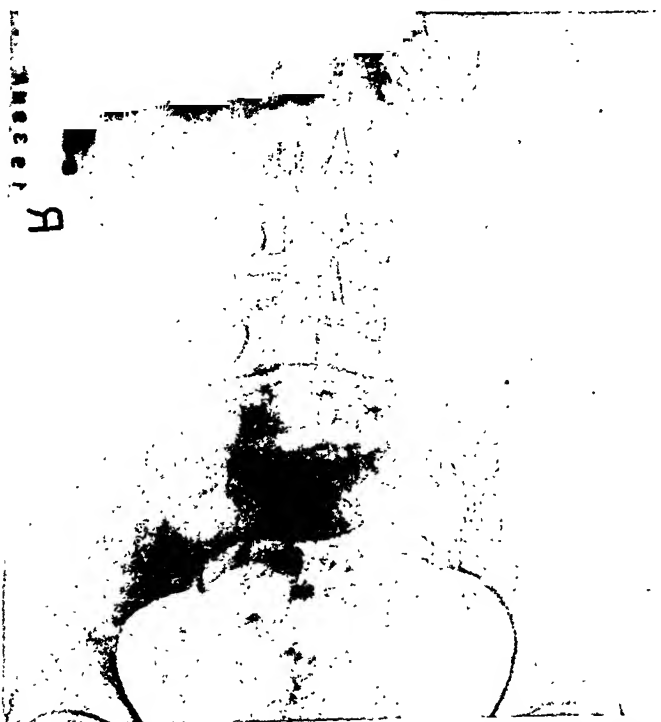

Fig. 18.—Anteroposterior view of lumbar spine of Case VI, showing extensive decalcification and beginning secondary tilting.

heart disease, and a nodular goiter slightly toxic, entered the hospital complaining of severe backache. Her blood counts and blood chemistry values were normal. The urine con-

tained no albumin. The backache had been growing in severity during the last year, so that at present she is confined to bed most of the time. The backache is over the entire lumbosacral region; it is aggravated by the slightest physical exertion. It does not pain her when she lies quietly. If she rotates her body to the right, she has a sudden severe pain in upper

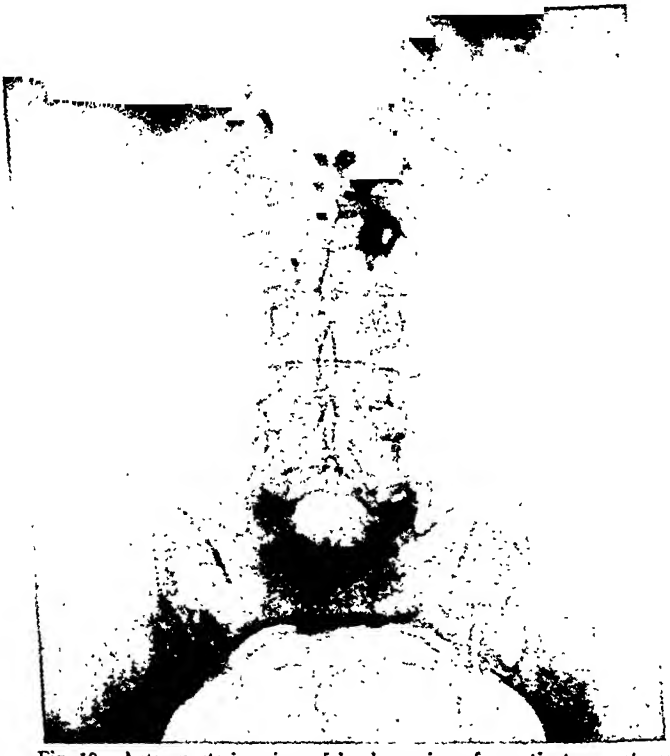

Fig. 19.—Anteroposterior view of lumbar spine of a patient, seventy years of age, who has a malignancy of the breast. The decalcification is not so marked.

lumbar region. Heat relieves the pain only temporarily. The pain was made so obviously worse by manipulation of the spine that a tentative diagnosis of metastatic malignant invasion of spine was made. However, an *x*-ray of the spine showed only an extensive decalcification of vertebrae. Under bed rest, high calcium intake, and viosterol, she was relieved completely of her symptoms. The *x*-ray of the spine of this

patient is shown in Fig. 18. This should be contrasted with the plate of a patient of the same age with a malignancy of the breast (Fig. 19).

The mechanism of the *osteoporosis* which is commonly seen in the elderly diabetic is not understood. It often occurs in elderly individuals who have no diabetes. It seems, however, important for the physician to know that it exists and to take it into account in treating such patients. With the existence of the osteoporosis one can understand why fractures occur so readily. It should be further appreciated that healing occurs quite as readily as in normal bones if a supply of calcium and viosterol is furnished in the diet. The excessive tendency to calcification of blood vessels is best explained as due to local degenerative changes in the vessels. In such sites calcium can be deposited from a blood serum containing normal quantities of calcium. Virchow,[10] in discussing metastatic calcification, has contended that nephritis is a necessary component of the process. It should be recalled that the senile diabetic kidney is an arteriosclerotic one. This may therefore be an important contributing factor.

STAPHYLOCOCCUS INFECTION

A malignant staphylococcus infection is a serious disease, but when it appears in a diabetic it is a tragedy.

Case VII.—In 1930, a man, sixty-two years of age, entered the hospital with a mild diabetes. His urine could be kept sugar free with a moderate restriction in his diet. For some three months he had recurring furuncles. Seemingly he was unable to acquire sufficient immunity to rid himself of them completely. One day he fell and struck his right breast. Shortly afterwards a hard brawny area appeared involving all the tissues. This gradually extended into the pectoral muscle, causing fixation. Mesially it was limited by the sternal attachments. The mass became dusky red in color, which changed not at all from day to day. Moist compresses, therapeutic *x*-ray treatments, applications of staphylococcus phage, and surgical incision were ineffectual in causing any resolution of the tissue. Over a period of two months' time the infection persisted and finally spread to the opposite breast and pectoral muscle.

During all the course of the disease the patient was most cooperative in taking food. Regular insulin was used in repeated doses through the twenty-four hours' time so that the urine remained sugar free. The patient finally died of a metastatic brain abscess with a terminal meningitis. A number of consultants saw him but were unable to offer any therapeutic help.

Case VIII.—In June, 1939, a man sixty-seven years of age, who presented the classical picture of a mild arteriosclerotic diabetes, was seen in consultation. He had remained sugar free with moderate restrictions in his diet but continued to have a high blood sugar. Approximately ten days before he was seen, he complained of an ingrowing hair beneath the lobe of the right ear. At this time he was not taking insulin. The record is not clear as to whether he scratched it or one of his attendants pulled out the hair at his request. Within a few days' time a swelling developed in the parotid gland. This became hard, brawny, and dull red. It was quite painful. The pulse increased somewhat, but the temperature did not rise immediately. The sugar tolerance, however, began falling so that increasing doses of insulin were required. A therapeutic *x*-ray treatment was given over the gland and finally an incision was made. A small amount of serosanguinous fluid was obtained from the incision which yielded on culture a staphylococcus.

The patient's condition continued to grow worse. The swelling extended so that the eye was closed and the induration reached the midline below his chin. He became toxic. He was confused and later completely disoriented. The extension of the lesion beyond the gland resembled that of an erysipelas. If one had not had unmistakable evidence of a staphylococcus infection and an involvement of the parotid gland, the differential would have been difficult.

The suggestion was made that staphylococcus antitoxin should be given a trial. There was much to recommend the antitoxin. The spread seemed to be by way of the lymphatics and the general systemic effect was out of proportion to the temperature and pain of the local lesion. Twenty thousand units were given intramuscularly at once. Although the pa-

tient was not sensitive to the horse serum, a severe chill followed within an hour's time. This was relieved by adrenalin. Ten hours later the swelling of the face was much less and the patient was somewhat less disoriented. Another 10,000 units were given preceded by adrenalin. Eight hours later the temperature had risen to 104° F. At this point the heart began to fibrillate. Morphine, oxygen, and quinidine controlled the fibrillation by morning. From this time onward the recovery was assured. The mentality gradually cleared and the parotid gland softened up and afterwards discharged a small quantity of pus.

When one reviews these two cases, which resembled each other so strikingly at the onset, it is difficult to escape the conclusion that the antitoxin was the deciding factor in the recovery of the second patient. The whole subject of toxin production by staphylococcus and antitoxin neutralization has been actively studied of late. There is every reason to believe that we will in the near future have more definite agents for combating these dreaded infections. The bacteriology of this subject has been recently exhaustively reviewed by Blair.[11]

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Medical Clinics of North America
January, 1940. Chicago Number

CLINIC OF DR. CARL F. SCHAUB

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DISEASES OF THE EYE IN ELDERLY PATIENTS

IT is difficult at times to place precisely the end point where senile degenerative changes in general are no longer a simple physiologic katabolic process but rather are changes dependent upon a definite pathologic entity. Then, too, after a consideration of the various and sundry manifestations of the so-called senile degenerative changes, especially of the eye, one wonders whether one and all do not have their basic cause in vascular changes (sclerosing endarteritis) which in itself is a pathologic entity. Senile changes are in evidence in the eye with quite consistent regularity and range from the well-known arcus senilis of the cornea to cataract, partial or complete, and finally to changes in the fundus itself.

The diagnosis as to the ocular cause of failing vision in all cases, not only the senile, can and should be made. This is important from a standpoint of: (1) definite knowledge of the presence or absence of local eye disease which might be in need of treatment, and (2) from a standpoint of better understanding of the patient and as an aid in the general diagnosis, prognosis and treatment. It is obvious that it is first necessary to recognize that there is a decrease of the visual acuity. Too often no attention is paid to the visual status, especially of the senile patient, until such a time that the visual embarrassment makes the condition manifest itself. Too often also is the cause of failing vision, in the aged especially, attributed to "old age change" without definite knowledge of such. Many a patient has been allowed to become irreparably blind from the lack of a timely and judicious investigation, or

allowed to remain blind when such a condition could be relieved.

The medical student of today in nearly every course of ophthalmology in our medical schools is being impressed with the fact that he must know how to determine the visual status of an eye, *i. e.*, "take a vision," and furthermore, that no general physical examination of any patient can be considered complete without an examination of the visual acuity. A vision chart is easily obtained for a few cents. The routine use of such a chart would be of tremendous value to the patient's safety and add to the thoroughness and prestige of the general practitioner.

Failing vision in the elderly patient is due, in the main, *to four causes,* namely:

1. *Changes in the lens itself* (sclerosis or cataract, partial or complete).
2. *Vascular changes in the fundus,* associated with similar generalized vascular changes.
3. *Central macular senile degeneration.*
4. *Glaucoma simplex,* alone or coexistent with any of the above types.

CHANGES IN THE LENS

It is rare not to find some change in the transparency of the lens in the sixty-year-old patient. It is reported that lens changes to some degree occur in upwards of 90 per cent of subjects over the age of sixty-five (Barth). The changes range from a more or less hazy hue (nuclear sclerosis) to actual opacities. The opacities are: (1) the so-called "riders" which appear as thin spicules in the periphery (equator) of the lens, and (2) the opacities, which appear multishaped and of various sizes and in various locations, *i. e.*, nucleus, cortex, central and peripheral. It is these latter which typically progress to maturity. It is interesting to note that, as a general rule, the later in life opacities in the lens are first seen, the less likelihood of such opacities progressing to a mature vision-taking cataract. Changes in the lens first noticed at the age of sixty, or better sixty-five or seventy, frequently do not advance to the point where they affect vision materially. Similar changes first noticed at the age of forty-five or fifty more frequently mature.

It may be here stated that there is still a notion in many quarters that a patient may be "too old" to have a cataract removed, even though the cataract has caused blindness, dependency and the unhappiness that is attendant upon blindness. Old age is difficult enough to bear without keeping a major affliction, which in most cases could be relieved. Unless a patient, regardless of age, be almost in imminent expectation of his end or be an extremely poor risk, he or she should at least be considered a candidate for cataract extraction if such is indicated at all. Such a procedure can be made the source of but little if any vital risk and of but little hardship to the patient. No patient is too old simply because of years.

CHANGES IN THE FUNDUS IN VASCULAR DISEASE

For many years the ophthalmologist, working alone or in conjunction with the medical clinician, has been attempting to classify generalized vascular disease by the varying picture the different types manifest in the fundus of the eye. The various types of vascular disease do, in the main, present individual, though not always pathognomonic, differences. From a prognostic standpoint, not only as to the maintenance of vision but more especially as to life expectancy, or an anticipated cerebral vascular accident, such a clinical classification made with aid of the ophthalmoscope is of considerable value. Such a classification is here offered:

1. Simple generalized hypertension.
2. Hypertension with retinal angiosclerosis (including albuminuric retinopathy).
3. Simple retinal angiosclerosis.

Simple Hypertension.—By "simple hypertension" is meant that case of high blood pressure which is primary and in which the general picture of high blood pressure is noted at a time when there is neither general nor retinal evidence of arteriosclerosis. In general it can be said that the retina gives only little suspicion, in itself, of high blood pressure in the early stages. It is more the rule to find a "normal fundus" than a fundus which is pathologic, unless there is marked kidney retention and definite evidence of vessel sclerosis. But in those individuals forty-five or fifty years of age who have developed a high blood pressure slowly over a period of a few

or more years, the retinal vascular elements except for a "fullness of the arteries" are undisturbed. From a prognostic standpoint the outlook, even in high degrees of elevation of blood pressure, is favorable in the face of what appears to be a normal fundus picture without vessel sclerosis.

Case I.—Mr. J. S., aged forty-five, in 1932 was referred for the purpose of fundus examination because of a persistent hypertension (systolic pressure 180 to 220) which was first discovered some two and a half years previously. (Presumably the blood pressure was within normal range at the time of an insurance examination in 1927 when he was forty years of age.) The patient had no subjective symptoms of any importance and the retinal vessels and fundi were normal to ophthalmoscopic examination. Because of this latter finding it was inferred that the condition of the general vascular bed was good and consequently a good prognosis, at least for the immediate future, was given despite a systolic pressure of 220 on the day of examination in 1932.

Hypertension with Retinal Angiosclerosis.—(Above case, Mr. J. S., continued.) The same patient, seen again in early 1939, after a lapse of seven years, was referred by the same clinician for fundoscopy. At this time there were subjective complaints of dizziness, headaches and weakness progressive over a period of two years, since 1937. Vision previously 20/20 with correction, was now 20/30 best in each eye. There was definite evidence of quite a marked degree of retinal vessel sclerosis, as manifest by tortuosity of the vessels and variations in their caliber. Gunn's signs, or localized arteriovenous constriction (indentation of the veins where crossed by the arteries), marked increase in the "light streaks" of the vessels, and few small, disseminated multishaped hemorrhages along the course of the vessel in each fundus were present. The branches of the superior and inferior vessels which supplied the macula were exceedingly fine and narrowed and there was a "disturbance" (edema-ischemia) in the macular area.

Aside from information gained by knowledge of the patient's subjective symptoms and also from the fact that there was now evidence (blood chemistry and urinalysis) of a low

grade retention of nitrogenous products, a grave prognosis was given because now, in the face of the persistent generalized hypertension (180-200 systolic), there was definite evidence of marked vessel wall damage. The condition of the kidneys showed this was by no means limited to the vessels of the retina. Cerebral vascular accident can be anticipated and expected at any time.

In this type, with hypertension first followed by arteriosclerosis, the prognosis as to life is grave. Ophthalmoscopic examination of the fundus gives a clew to this, ofttimes long before subjective symptoms arise or a general examination so reveals. In the ophthalmoscopic examination of the retina for evidences of circulatory changes, not only changes in vessel walls are noted (angiosclerosis), but also those changes which for greater part are secondary to vascular changes, namely: (1) edema (transudation); (2) hemorrhages in various stages; (3) fat-lipoid deposits; (4) hyaline deposits, and (5) glial and connective tissue proliferation.

Without commenting on the causal relationship between high blood pressure and subsequent arteriosclerosis, it is significant to note that should there occur precocious evidence of retinal angiosclerosis—a hypertension is usually found to co-exist—and again, with both a hypertension and an arteriosclerosis present, the outlook as to life or anticipated cerebral vascular accident is grave regardless of the age of the patient.

When, as a rule, arteriosclerosis becomes visible in middle-aged or younger persons, one or two factors can be held responsible for its early appearance. They are, to quote Elwyn: "(1) an inherited deficiency in vessel walls, and (2) an undue intensification of the wear and tear of the walls of the vessels. The latter occurs in two forms: as an accompaniment of diffuse glomerulonephritis and malignant renal sclerosis, and, individually, as essential hypertension. The former patient has the nephritic pale appearance, the latter is a 'red hypertensive.'"

It is in the *nephritic type of hypertension* due to generalized arterial constriction of the small arteries that evidence of retinal vessel sclerosis occurs so frequently in the middle-aged and younger patient. Signs of hemorrhages, transudate, and finally the typical albuminuric retinopathy with the fre-

quent star-shaped figure in the macula then appear. It has been commonly known since the fundus was first examined that the life span of such a patient rarely exceeds the findings by two years.

In the *essential type of hypertension* there is no evidence of arterial constriction. Representing the immediately foregoing types, even though they occur in younger individuals, the following cases are cited because they follow the general rule of "hypertension alone—prognosis fair or good" and "hypertension with arteriosclerosis—prognosis poor":

Case II.—Mr. H. D., aged thirty-two, having a familial history of essential hypertension, was checked for glasses in 1936 and fundoscopic examination routinely performed. The blood pressure was 220+ systolic—and apparently had been so a number of years—but the fundus vessels except for "fullness" were normal. There was an absence of a-v nicking, no increase in light streaks, etc. Three years later the individual was in good health and the fundus picture was still normal. The outlook as to life is fair even in the face of the persistent hypertension.

Case III.—Mr. J. S., aged twenty-nine, was first seen during a routine examination for refraction in November, 1938. This patient had not consulted a general physician. He complained of headaches and dizziness which he ascribed as probably due to a need of glasses. Vision was found to be 100 per cent in right eye, but only 50 per cent in the left. There was no refractive error and glasses were therefore not needed. I was most surprised to find marked evidence of blood vessel damage, *i. e.*, marked nicking and compression of veins, increased tortuosity and light streaks, many small hemorrhages about the course of the larger vessels, and hazy ischemic patches (one in the macula of the left eye, accounting for the lowered vision) about the ends of many of the smaller end vessels. His blood pressure was 235/160. Referred to internist, there was some little evidence of kidney retention (blood chemistry studies) and the urine was faintly positive for albumin. In view again of the hypertensive picture with the marked vessel sclerosis, a grave prognosis was given. On

March 2, 1939, the patient began to fail rapidly; he had a slight left hemiparesis, followed in a few days by urinary suppression. Death apparently resulted from an acute uremia.

Case IV.—Miss V. J., a nurse aged twenty-five, was referred in October, 1938 for ophthalmoscopic examination because of a known hypertension of three or four years' standing. The fundus vessels in her case too showed marked evidence of precocious arteriosclerosis, but to a much less degree than in the patient mentioned in Case III. Here again a grave prognosis was given. Examined the last time in May, 1939, she still seemed in good health, but the retinal vessel damage seemed more, there having appeared a few pinpoint hemorrhages and for the first time evidence of kidney dysfunction—albuminuria. It will be interesting to follow this case as, again, a bad immediate prognosis was given even before the information of kidney retention was obtained.

Simple Retinal Arteriosclerosis.—The changes in the vessels of the fundi which occur later in life, after the age of sixty-five to seventy, especially without evidence of a generalized hypertension, go hand in hand with the general body vascular sclerosis and offer, as a rule, no grave outlook. The ophthalmoscopic picture parallels that of hypertension plus sclerosis, but has a few distinguishing features, chief among which are (1) the very *slow rate* of progress of the changes of the vessels of the retina; (2) the *lack* of a *transudate* and *edema*, which give place rather to patches of ischemia and slow degenerative changes; and (3) the far *less frequent appearance of retinal hemorrhage.*

It is our experience that, in the main, this class of patient shows rather a low blood pressure and the prognosis is that of the usual progress of senile decline. Again, even though the caliber of the vessel is reduced in size, etc., the usual eighty to eighty-five-year senile has less evidence of arteriosclerosis and retinal tissue changes than a far younger senescent in whom the hypertensive picture is coincidentally present.

Is it a significant fact that arteriosclerosis occurs almost invariably in the hypertensive patient if he survives long enough? Is it likewise significant that, as a rule, the less the degree of angiosclerosis the longer the hypertensive patient

lives, and, that with simple arteriosclerosis appearing first, the hypertension complication occurs less frequently than vice versa?

Central Macular Senile Degeneration.—This affection of the senile patient, which can occur also in the younger subject, is of great interest from the standpoint of failing vision in the aged. The condition, usually bilateral, affects only the macular areas and therefore only central vision. There is a marked decrease in central vision, which may go on to a central blind spot (*scotoma*) but never to complete blindness. It is due to cystic degenerative changes in the macula, which in turn are due probably to: (1) sclerosis of the macular branches of the retinal vessels, and (2) a sclerosis of the blood spaces of the choroid, from which the macular retina receives a major portion of its blood supply. Why only the central retina in the macular area is involved and suffers this degenerative change is not clearly understood. Treatment is of little or no avail.

Glaucoma Simplex, Alone or Coexistent with Cataract or Fundus Changes.—A cause of failing vision in the senile patient which too often is overlooked is glaucoma simplex. In a younger subject there can hardly be even any excuse for overlooking such a condition. Glaucoma simplex is notoriously liable not to exhibit any pain or subjective symptoms other than a slowly progressive decrease in vision. And, in the senile patient, especially when a forming cataract is known to be present, the general practitioner frequently attributes the constantly failing vision solely to the cataract. Glaucoma can be and frequently is coexistent with cataract or other pathologic conditions of the eye.

It can be understood, but certainly not condoned, how an eye in the senile patient known to have a cataractous lens can be allowed to go on to irreparable blindness, which blindness was due, *not* to the cataract, but to the glaucoma! A plea is made to have any patient, young or old, who exhibits failing vision examined at intervals even though a diagnosis of cataract or fundus changes has been once definitely made by the general man or the ophthalmologist. Simply because a diagnosis—*e. g.*, of cataract—has once been made it does not necessarily follow that all failing vision after that is really

due solely to the cataract. Two cases are here cited to show why periodic ophthalmologic examinations are necessary:

Case V.—Mr. J. S., aged seventy-six, was seen in the clinic for the first time on April 2, 1939. He was blind and came to the clinic prepared to be hospitalized for cataract extraction. Failing vision had been first noticed six or seven years before. At that time he consulted an "irregular" practitioner who diagnosed cataracts and prescribed "drops." The patient had consulted this practitioner at six-month intervals until 1935. He was told to continue with the "dissolving drops" and, if they did not "work," to wait until his vision was gone, at which time he could be operated on.

The patient did wait from 1935 to 1939 without further use of any medication or without any examination of his eyes. The vision continued to fail progressively until, in the early months of 1939, as he stated, he "could no longer see anything." His hopes were high that an operation would restore his vision. Examination revealed both eyes blind even to the detection of the strongest light. The cataract in the right eye was mature and this fundus could not be viewed with the ophthalmoscope. The cataract in the left eye was very immature, *i.e.*, the lens was only slightly clouded, and ophthalmoscopic examination showed a complete, deep glaucoma cupping and atrophy of the nerve head. The tension in both eyes was 50 on tonometric reading. Clearly a case of glaucoma simplex unrecognized! Had competent periodic ophthalmologic examinations been made in this case it is likely that through the medium of miotic "drops" or surgery the vision in both eyes could have been saved, and, if a cataract did demand removal in one or both eyes, the patient would have had a restoration of at least some vision after such a removal.

Case VI.—Mr. S. D., aged seventy-one, was diagnosed as having incipient cataracts and retinal angiosclerosis in 1932 or 1933, some six years before being first seen in our clinic in October, 1938. The diagnosis was made by a competent ophthalmologist. Vision continued to fail. The progressive failure was attributed to the ocular diagnosis as first made. No ocular examination was made between 1933 and 1938.

Each eye was blind, light perception being absent. There had been no pain at any time. The cataracts were not "ripe" and fundus examination showed marked glaucomatous cupping and atrophy of each nerve head. *Glaucoma, not the cataracts or the retinal angiosclerosis, had caused the blindness.*

In these two cases permanent loss of vision could, in all likelihood, have been prevented had the glaucoma been recognized.

SUMMARY

In summary, a discussion of a few of the more common causes of failing vision in the senile and their prognostic significance has been presented. The necessity of routine vision examination by the general practitioner in the course of routine physical examination, and the necessity of periodic ophthalmologic examination in all cases of failing vision—even though an ocular diagnosis had once been made—should be apparent. There should be a vision chart in the office of every medical practitioner. The old adage still holds, "the mistakes we make are not so much because we do not know, but because we do not do."

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Medical Clinics of North America
January, 1940. Chicago Number

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TREATMENT OF THE SKIN IN THE AGED

ALTERATIONS which may be attributed to involutional changes do not occur uniformly in all individuals, and vary considerably in different tissues in the same individual. In other words, some persons will be found to have survived the ravages of time in all tissues to a greater degree than normal, while others will appear older than they really are. On the other hand, the various systems and organs partake of this change irregularly, so that in one individual the superficial arteries may be sclerotic at a relatively early age, while they maintain their elasticity for an unusually long time in another. The same applies to the skin; in certain individuals involutional changes appear even before middle life, while the skin of some persons maintains its youthful appearance even into advancing years.

In his classic "Old Age, the Major Involution," Warthin said: "Changes in the elasticity of the skin usually accompany those taking place in the body and head hair. 'Wrinkles,' 'crow's feet,' dryness, roughness and discoloration and a tendency to hyperkeratosis gradually develop after the fifty-fifth year; but here again the individual difference is so great, and the influence of the environment so potent, that no positive statements can be made as to the time and degree of the skin changes due purely to age."

SIMPLE SENILE CUTANEOUS ATROPHY

Case I.—The first patient whom I wish to present is a woman, aged seventy, who is in good health, considering her age, but presents mild abnormalities in the skin. The skin is

sallow to yellowish brown in color, is thin, glossy, slightly scaling, wrinkled and folded, dry and inelastic. It is easily lifted and lies in loose folds; the subcutaneous tissue has decreased so that the veins are abnormally prominent. The hairs over the body have reverted to the downy variety. Over the cutaneous surface are small atrophic plaques, and over the trunk are many brownish to black lesions (Fig. 20), oval or

Fig. 20.—Multiple benign epitheliomas (senile warts).

round, slightly or moderately elevated, with a velvety or verrucous surface, containing comedo-like keratotic bodies. Scattered over the trunk are also erythematous papules, varying from 2.0 to 5.0 mm. in diameter. Both types of lesions have been slowly appearing since middle life. Some of the former are also present on the face.

The diagnosis in this case is simple senile atrophy, which

appears characteristically both on exposed and covered surfaces, with dryness of the skin as a result of atrophy of the sweat and sebaceous glands. In a consideration of a diagnosis of the brown verrucous lesions, five conditions must be considered, namely: *nevus pigmentosus, senile verruca* (benign epithelioma), *pigmented basal celled carcinoma, melanoma,* and *metastatic melanoma.* Biopsy should be performed to be certain of the diagnosis.

Pigmented Nevus.—Nevus pigmentosus may appear in one of several forms, varying from non-elevated lesions a few millimeters to several centimenters in diameter, occurring singly or in great numbers; to the various elevated lesions, with or without hair. Since they are usually present at or shortly after birth, the history is often so definite as to confirm the diagnosis.

Epithelioma (benign).—The so-called "senile" or "seborrheic" verruca is a benign epidermal neoplasm (better termed "epithelioma," [benign]), which occurs only rarely early in life but, like all epidermal neoplasms, is more frequent late in life. The lesions occur on many regions of the body, chiefly the trunk, face and backs of the hands. They may be few or numerous, and often have their onset as multiple, scarcely elevated, yellowish brown lesions with a velvety surface; they gradually become more elevated and darker brown, and may in isolated instances be black. The pigment is melanin, which is located in the epithelium, so that a brown color is produced. However, it may be present in such large quantities and the tumor may be so thick that the color may be grayish or even black. The lesions are non-inflammatory, do not have an inflammatory areola, and appear as if pasted on the skin, with no surrounding infiltration. They produce no symptoms, with the exception of occasional pruritus. They very rarely become malignant, resulting in squamous celled carcinoma. The rarity of malignant degeneration is reflected in the fact that not over a dozen cases of such change are reported in the literature.

Basal Celled Carcinoma (melanotic).—Pigmented basal celled carcinoma does not differ clinically from the non-pigmented variety. The location is predominantly on the face, but they may also appear on the trunk. The rolled pearly

border identifies the ordinary variety, while the elevated type has greater similarity to the four other lesions being discussed. The color is usually grayish or blackish, since the melanoblasts are contained in the tumor elements and are beneath the epithelium.

Melanoma.—Melanoma originates in two ways: either from the normal skin, or in a pre-existing pigmented nevus. When the tumor originates in normal skin, a brownish non-elevated lesion is first noted by the patient; this grows slowly over a period of several months or years. This lesion is known as a "lentigo maligna," and is differentiated from simple lentigo by microscopic examination. This shows multiplication of melanoblasts at the epidermodermal junction, with some of them remaining in situ and others working their way out through the epithelium, so that melanin-containing cells are seen even in the stratum corneum. After the lentigo maligna has been present for months or years, a tumor originates in the center, which may appear as a red granulomatous mass or may be deeply pigmented. The former results from growth of non-pigmented melanoma, and the latter from local extension of pigmented melanoma. In the meantime, the brownish lentigo may become darker in color and be blue-black. Lentigo maligna or full-blown malignant melanoma is usually a solitary tumor.

Metastatic Melanoma.—Metastatic melanoma appears in the form of blue-black lesions scattered over various parts of the body. The skin over the tumors is smooth and not velvety. The primary tumor is usually discoverable, or a history is elicited that a "mole," often blue-black, has been removed. The lesion which had been removed was not a nevus but already a malignant melanoma, which had metastasized before removal.

The other tumors which this patient shows, the erythematous papules, are acquired angiomas, often called "senile angiomas."

CARE OF THE SENILE SKIN

The significance of the various signs presented by the patient is as follows: The dry senile skin must be cared for much the same as that of a baby, taking special care not to overbathe, since too frequent use of a hot water bath, espe-

cially in connection with strong soap, tends to remove what little oil there is present in the skin. The parts of the body which sweat the most, namely the axillae and genitalia, may be bathed daily if desired, but a complete bath should be taken not oftener than *once* weekly in the winter and twice weekly in the summer. The *soap* which is used should be superfatted, such as Basis soap (Duke Laboratories), Hazeline soap (Burrows Welcome), or Cold Cream soap (Almay Pharm. Corp.). Many of the ordinary soaps on the market are too strong for such a skin. In order to counteract the effect of the cold weather, which tends to dry the skin, ample clothing should be worn when outdoors in the winter. The dry indoor air should be humidified in order to avoid its drying effect on the skin. The entire problem of climate can best be solved by removal to a warmer region during the winter months.

In addition to preservation of the oil present in the skin as outlined above, it is often advisable to add oil to the skin in the form of some *oily lotion*, such as *Cook's Emulsion Base*, the formula and directions for making which follow:

Olive oil	1880.0
Oleic acid	200.0
Triethanolamine	40.0
Water, q.s. ad	3785.0

The olive oil is placed in a dry 1-gallon bottle and the oleic acid is added. They are well shaken, coating the inside of the bottle. The triethanolamine is placed in a measured graduate, and is added to the oil and acid. The graduate is rinsed several times with water, and the rinse water is added to the mixture. This is the critical stage in the process, and all the triethanolamine must be added. Then 1000 cc. of water are added, and the mixture is thoroughly shaken. More water is added in small quantities, shaking upon each addition until the gallon bottle is entirely filled. The mixture is placed in a separatory funnel and is allowed to stand for forty-eight hours. The water which separates out at the bottom is drawn off, and then the emulsion is removed, leaving the excess of oil which had separated at the top. The emulsion may be perfumed with oil of lavender if desired.

This emulsion may be used as often as desired, but it

should be applied after each bath. The skin should be well oiled but not dripping. One occasionally encounters patients whose skins are irritated by triethanolamine, in which case a simple oil, such as mineral oil, or the more complex Nivea oil, may be used.

The *epitheliomas* (senile warts) hardly ever become malignant and are usually removed only for *cosmetic reasons;* hence those on the face are the ones most frequently treated. Since the growth is an epidermal neoplastic one, *fulguration* is the method of choice. The acquired *angiomas* are almost exclusively on the covered portions of the body, do not grow larger than 5.0 mm. or so in diameter, hence are usually not treated. If the patient desires, they may be *cauterized* by means of the electric cautery.

DEGENERATIVE SENILE CUTANEOUS ATROPHY

Case II.—The next patient is a man, aged sixty-five, who presents scaling, somewhat erythematous lesions on the face (Fig. 21) and hands. In addition, on the right cheek there

Fig. 21.—Multiple senile keratoses, with intermediate type carcinoma beneath crust on right cheek.

is a crusted lesion which bleeds when the crust is removed. The lesions on the backs of the hands are more keratotic and less inflammatory than those on the face. Diagnosis is degenerative senile atrophy, predominantly on exposed surfaces and aggravated by the elements, with senile keratosis of the face and hands.

The bleeding of the lesion on the right cheek strongly suggested that it was malignant, so biopsy was performed. By means of a Keyes cutaneous punch, ¼ inch in diameter, a small portion of the border was removed, fixed in Bouin solu-

tion, prepared routinely, and stained with hemalum, erythrosin and saffron. On section there was an ulcerated area, at the border of which neoplastic cells were invading the dermis. The cells were larger than those in basal celled carcinoma, so that a diagnosis of intermediate type of carcinoma was made. The dermis showed considerable collagen, which was normal and stained yellow, but a part of the collagen was degenerated and stained pink. A biopsy specimen from the lesions which were clinically keratosis senilis showed the typical changes for that condition.

The keratoses were treated by the fulguration spark, while the carcinoma was treated by means of a single exposure of 6 skin units (1980 r. units) of unfiltered roentgen rays. This was followed in one week by severe erythema, edema and erosion. The lesion was dressed with calamine liniment in the daytime and 5 per cent ammoniated mercury ointment at night until it had healed. Owing to the intense reaction from the roentgen rays, such treatment cannot be repeated in the same area. The type of carcinoma resulting from senile keratosis on the face is usually basal, intermediate, or mixed in type, while that originating from the same type of lesion on the dorsum of the hand is uniformly squamous celled, which of course makes it a much more dangerous tumor.

Squamous celled carcinoma may also develop on the face, and carcinoma of the lip, which usually follows keratosis or leukoplakia, is always squamous celled. Carcinomas of the oral mucosa are also almost always squamous celled. *Squamous celled carcinoma is treated by excision or filtered radium or roentgen rays.* The dosage is 5000 to 6000 roentgens, depending on whether the lesion is small or large. Exposure may be made at the rate of 250 r. units daily or 1500 r. units twice weekly. This treatment results in a second degree reaction, which is followed by healing, with atrophy and perhaps telangiectasia.

VULVITIS ATROPHICANS (KRAUROSIS VULVAE)

Case III.—A woman, aged sixty, complained of intense pruritus of the vulva. Examination showed the vulval epithelium to be smooth, glistening, semi-translucent and parchment-like. It was pearly white in color. The labia minora

and the preputial folds had completely disappeared, and the vaginal orifice was greatly constricted and rigid. A diagnosis was made of vulvitis atrophicans.

The patient usually consults a physician during this *terminal stage,* when pruritus is most intense, but is occasionally seen during the first or second stage. The *initial stage* is one of inflammation. The vulva appears edematous, erythematous and tender. The patient scratches to relieve the burning and itching, so that superficial abrasions and petechiae may be present, along with some secondary infection at times. The *second stage* is that of thickening, with a whitish or grayish color and isolated erythematous areas due to petechial hemorrhage. The tissue becomes inelastic, and the labial and preputial folds flatten out. The changes are said also to involve the skin of the perineum, extending even posterior to the anus.

The cause of kraurosis vulvae is inseparably linked with involutional changes. The condition appears after the menopause, but only a small percentage of women are affected. *It must be differentiated from leukoplakia vulvae,* which is characterized by bluish-white or whitish plaques that appear as though they had been pasted on the epithelium. The chief significance of kraurosis vulvae, in addition to the intense discomfort from itching, is the prominent possibility of carcinomatous degeneration in the form of squamous celled carcinoma.

Treatment consists of the injection of theelin or some similar substance in the early stages while, in the late stages, vulvectomy is the method of choice. Carcinoma should be treated by vulvectomy, with or without radium or roentgen therapy.

SENILE PRURITUS

The next patient whom I wish to present has one of the most distressing complications of the senile skin, and one which up to recently was most intractable as regards therapy.

Case IV.—Mr. F. G. K., aged sixty-nine, was first seen on October 7, 1932, complaining of pruritus ani and generalized pruritus. He had had angina pectoris and had suffered three paralytic strokes, in 1921, 1922 and 1926, with slight residual paresis on the left side of the body. Diagnosis in the neuro-

logical clinic was cerebral arteriosclerosis. Blood pressure was 170 systolic and 60 diastolic. The anal region showed considerable dermatitis as a result of application of irritating substances. He was given calamine liniment to the anal region, along with roentgen therapy and sodium bromide (not potassium bromide) intravenously in a 10 per cent solution, from 20.0 to 50.0 cc. three times weekly. Sixteen injections were given up to January 16, 1933, when the pruritus had been entirely relieved.

The patient was again seen on August 22, 1933, with a recurrence of generalized pruritus. He was given eleven intravenous injections of sodium bromide in the same dosage as before, after which the itching was again relieved. He returned on November 9, 1934, complaining of severe itching of four days' duration. He was given sixteen intravenous injections of sodium bromide, with relief. He was again seen on April 20 and July 8, 1938, at which time he was given twelve and fifteen intravenous injections of sodium bromide, with considerable improvement. Roentgen therapy was given to the anal region on occasions.

The cause of senile pruritus may be either senile changes in the skin, or it may result from cerebral arteriosclerosis or may be due to a combination of the two. In addition to the pruritus itself, some of the patients also manifest acarophobia, usually due to arteriosclerosis. While acarophobia also occurs in younger individuals, it is a not infrequent accompaniment of pruritus in the aged. The patient maintains that insects are crawling about in the skin, and produces collections of lint and epithelial debris as evidence in an effort to prove his case. He may come in with a bottle of ants, flies and bugs, which he maintains he has removed from the skin. He may do considerable damage to the skin in an effort to remove the imaginary insects, with resulting clinical picture of neurotic excoriations. In simple senile pruritus without acarophobia, extensive scratching may result in linear excoriations.

The *treatment* of senile pruritus has been unsatisfactory in the past. Local applications have been ineffective, and various sedatives administered orally have not given relief. Bromides given intravenously in the form of sodium bromide have resulted in appreciable relief in all my patients, although large

doses of bromides given orally have not been effective. It may be that the temporary high concentration is the important factor in the success of the drug when given intravenously. It is the only treatment with which I am familiar that is of distinct benefit in senile pruritus. In addition to the administration of bromides, care should be taken of the skin according to considerations presented above.

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Medical Clinics of North America
January, 1940. Chicago Number

CLINIC OF DR. SAMUEL J. TAUB

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TREATMENT OF ALLERGIC DISEASES OF THE AGED

THERE are a group of allergic diseases that occur particularly in the years past middle life, between the ages of fifty and sixty years. These are *bronchial asthma, perennial rhinitis* and *chronic urticaria.* I will first discuss the types of bronchial asthma as we see them during this period of life.

Bronchial Asthma.—We may divide the types of bronchial asthma into two large groups:

1. The *frankly allergic type* of asthma, which develops for the first time in an individual past the age of forty, and in whom positive skin tests and eosinophilia in the sputum and blood can be demonstrated.

2. The second group consists of patients who give *no family history of allergy;* skin tests are usually negative and the asthma is preceded by frequent attacks of upper respiratory infections or perennial rhinitis or an attack of pneumonia.

1. *Allergic Type.*—The allergic group of asthmatic patients comprise the large majority even in this age group. If one will pay particular attention to the history, one can elicit some allergic disturbance occurring in the patient perhaps years ago, such as a seasonal rhinitis that occurred for years but was so slight that no significance was paid to it, the patient believing that these attacks were merely attacks of acute coryza; also attacks of perennial rhinitis occurring for years under the guise of "colds." Sometimes a history of urticaria, as a food intolerance, disturbed the patient years ago and only after a carefully scrutinized history may these significant findings be uncovered and correctly interpreted in the light of the present asthmatic symptoms.

The etiologic agent in this age group in most instances can be found in the inhalant groups, such as chicken feathers, goose and duck feathers, dog, cat or bird hair, orris root, pyrethrum, horse dander, cottonseed, linseed, silk, wool, rabbit hair, house dust, glue, goat hair, dog hair, kapok, mattress dust, molds and yeasts in the air or house, and various pollens.

The foods eaten are exceptionally found to be a cause of asthma in this age group. Foods by inhalation, as in industrial exposures and such as may occur in bakers and millers from flour dust inhalation, are a common cause. Farmers exposed to grain rusts and smuts also may be affected with a severe type of asthma following inhalation of these fungi. Corn, rye and barley dust may also be responsible for a severe type of asthma. Recently a druggist at the age of fifty became sensitized to lycopodium dust spores. Skin tests to powdered lycopodium were positive on scratch testing, and its complete elimination from his environment resulted in a cure of the asthmatic symptoms.

In *testing* these patients it is very important to do not only cutaneous tests, but also intradermal tests, and sometimes passive transfer tests (Prausnitz Küstner) must be resorted to in order to determine the causative factor. It is a well-known fact that dryness of the skin and atrophic skins respond poorly to scratch tests, while intradermal tests are more sensitive but must be properly interpreted.

Environmental control of these patients is essential to relieve their asthma. Rubberized pillow and mattress covers as well as complete house dust precautions should be insisted upon and other inhalant factors etiologically present, as determined by skin tests, must be avoided entirely. This statement sounds simple enough yet, in practice, it is a very difficult procedure to enforce unless patients are carefully informed on how to avoid inhalant substances in the various forms to which they are exposed unknowingly. Visits to the home are often necessary to point out errors in elimination when patients actually thought they were eliminating certain inhalant factors. A recent asthmatic patient who reacted strongly to rabbit hair and horse hair obtained relief only after the complete elimination of an animal hair padding under the carpeting. It was very difficult to convince this patient, in spite of the fact that upon

a short stay in the hospital on several occasions the symptoms would clear up in a few days only to recur when at home.

It is also important to attempt to *hyposensitize* these patients, especially those sensitive to house dust, orris root, silk, molds, yeasts, and pollen. It is virtually impossible to escape these inhalant substances, either in the home or outdoors. Starting with a potent extract, in small doses of a weak solution, hypodermic injections are given once in three to five days until concentrated solutions can be tolerated. Then gradually the time interval of giving injections is increased to once in two weeks, then once a month, and finally stopped completely, when no further local reactions follow injections of the extract. Patients should also be retested from time to time, particularly if asthmatic symptoms recur after a period of relief; however, it is rare for relapses to occur after environmental factors have been completely controlled and hyposensitization treatments given correctly.

2. *No History of Allergy.*—I will now discuss the second group of patients who show negative skin tests and whose asthma usually follows frequent attacks of acute coryza or upper respiratory infections.

In this group of patients, changes in environment, diet, or weather have no influence on the asthma. The asthma is usually severe and may be even rapidly fatal at this age. Pathologically there seems to be more secretion in the bronchial tubes and less spasm than in the pure allergic group. There is also infection in the paranasal sinuses and bronchi, and complications of bronchiectasis and emphysema seem to follow early. It is believed that these patients liberate histamine or H. substance just as the H. substance or histamine is liberated on contact with specific allergens and antibodies.

Newer studies of this group lead one to believe that some irritant or perhaps infection causes a stimulation of the parasympathetic or cholinergic fibers in the bronchial tree, with release of acetylcholine and finally histamine. *Hyposensitization* with histamine hydrochloride should be attempted in these patients, starting with very small amounts, as little as 1:50,000; then 1:20,000, 1:10,000, 1:1000 and 1:100 dilutions. Injections should be given twice a week. I have also found the use of ammonium chloride, in 10-grain doses three times

a day, to be more beneficial than potassium iodide in these patients. Some do better when apomorphine hydrochloride (grains $\frac{1}{24}$) is added to the ammonium chloride mixture. Sinus infections should be treated conservatively by local shrinkage and proper drainage, but radical nasal operations are best avoided in these cases.

There is some evidence that *x-ray therapy* over the chest combined with *ultraviolet irradiation* may be of some benefit. The use of *iodized oil* in the bronchial tree is rather disappointing, and from my personal experience in a series of patients its use was of no benefit in 85 per cent. About 15 per cent of the patients were temporarily improved, but as soon as the instillations of iodized oil were discontinued, the asthma recurred. The real danger is that the oil will remain in the lungs after one to three years and it may be a potential danger in the development of a pneumonitis, atelectasis, or possibly a lung abscess.

The use of *aminophyllin* (grains $7\frac{1}{2}$ in 10 cc. of normal saline intravenously), often is beneficial in this group. Also *adrenalin* (1:500 in oil, 1 cc. intramuscularly), may control the wheezing for as long as twenty-four to forty-eight hours.

Perennial Rhinitis.—Perennial hay fever or perennial rhinitis is more common in the first three decades of life, but it does occur in the ages past middle life. The *symptoms* of perennial hay fever are generally the same as those of seasonal hay fever, namely, periodic sneezing and nasal discharge alternating with periods of partial or complete stoppage of the nose. The sneezing and watery nasal discharge are usually worse in the morning, whereas the nostrils are more likely to close up at night. Nasal polyps are frequently present and the nasal mucosa presents an edematous grayish water-logged appearance. Eosinophils are found in nasal smears, sometimes up to 100 per cent; however, even in the absence of eosinophils it does not preclude a non-allergic etiology. It is well known that allergic tissue is prone to superimposed infection and eosinophils may disappear when infection complicates the allergic process.

Combinations of allergic rhinitis and infection of the paranasal sinuses or of the lymphoid tissue of the nasopharynx are

commonly associated and it is of the utmost importance to recognize the allergic factors. Itching and sneezing are more typical of an allergic background and are not present in sinusitis due to infection. These infections are usually secondary complicating factors as a result of the allergic irritation, or they may exist as foci of infection not related to the allergic syndrome.

A carefully taken history is of the utmost importance in determining whether or not an allergic factor is present. In the history the following points should be sought:

1. A positive family history of other allergic disturbances.
2. A history of previous eczema, urticaria, asthma, or food sensitivity.
3. Possible onset as a seasonal hay fever due to pollens, with symptoms becoming perennial because of newly acquired sensitivity or superimposed infection.

In the *allergic group,* the environmental factors are of prime importance, such as feathers, orris root, animal danders such as rabbit hair and horse dander, or furs, cottonseed, flaxseed, house dust and fungi. Various articles of clothing, such as wool, silk, and also various dyes in clothing and cosmetics, may be the etiologic factor in a large percentage of patients. In this group foods are a relatively unimportant factor.

There are a group of cases, occurring particularly in women past the menopause, which are benefited by *hormone therapy* such as by theelin. Here some endocrine factor is probably responsible for the nasal symptoms and injections of theelin or theelin-like products plus small doses of thyroid frequently give excellent results.

Treatment by avoiding the causative antigens and controlling environmental factors, plus hyposensitization of *potent extracts is of prime importance.* The length of treatment required cannot be predicted in the individual case, since some patients respond after a few injections of the antigen whereas others will not be benefited until higher doses of the extracts are reached.

With regard to *nasal surgery,* it is best to avoid any radical procedures; sometimes it is better to remove nasal polyps and increase nasal drainage with local conservative treatment. The

use of irritating escharotics or zinc ionization does not benefit these patients and only adds additional scar tissue to an already highly sensitive and hyperplastic nasal mucosa.

There is also a well-defined group of cases of perennial rhinitis occurring during the ageing period of life due to *physical allergy,* that is, hypersensitivity to cold, heat, or light. Some of these patients are *sensitive to cold* and have symptoms after a sudden drop in atmospheric temperature. They feel better in warm sunny weather, but relapse during cold rainy spells. Also, sudden chilling of the body, as during exposure to inclement weather or when in draughts, will aggravate the symptoms. These patients can be controlled by desensitizing them to cold, by immersion of various parts of the body, such as the hands, in water which is gradually made colder; also, compresses held over the nose, first with warm water and gradually made colder until the patient can tolerate a low temperature without discomfort, will relieve these patients. The *heat sensitive* patients are more difficult to control because it seems that they are made worse by effort or exercise. Complete rest is advised in these patients. The *light sensitive* patients are aggravated by the actinic rays of the sun and may improve when exposed to ultraviolet light in gradually increasing doses.

Urticaria and Angioneurotic Edema.—The investigations of Walzer[1] have been most illuminating as to the production of urticarial wheals by the absorption of undigested protein from the gastro-intestinal tract. He has demonstrated with fish protein that it may be absorbed in an unchanged form into the blood stream and produce urticarial wheals on passive transfer sites within from eighteen to forty minutes after eating the fish. I have produced the same phenomenon with peanuts[2] and walnuts.[3] Where a hypochlorhydria exists, the wheal will be produced much faster whereas, in hyperchlorhydria, it takes considerably longer to produce the wheal. For this reason *hydrochloric acid* often gives considerable relief in the treatment of urticaria.

Sir Thomas Lewis[4] suggests that urticaria is caused by the dilatation of the superficial arterioles due to a local reflex through the terminal branches of the sensory nerves and initiated by the release of this H. substance in the skin. The area

covered by the wheal is the extent to which this substance has been released in the skin.

This H. substance of Lewis may be released in the skin in two ways: first by direct injury to the skin cells, and second, by circulating and entrapped poisons. Whether or not this H. substance and histamine are identical is not yet settled, since histamine has as yet not been isolated from skin extracts, but it may be possible that the H. substance is held in an inactive form in the skin cells until liberated by injury or toxemic damage histamine is produced. It is also possible that this H. substance reacts with choline, which has recently been identified as a constituent of tissues, and acetylcholin is produced which then releases histamine.

I wish to present here a *simple classification of the urticarial group:*

1. Urticaria due to foci of infection.
2. Urticaria due to specific drugs.
3. Urticaria due to specific foods.
4. Urticaria due to sensitivity to articles of clothing, such as wool, silk, or dyes in wearing apparel.
5. Urticaria due to physical agents, such as heat, cold, and the rays of the sun.
6. Urticaria due to skin parasites like trichophytons and scabies.
7. Endocrine gland dysfunctions of the ovary and thyroid.

Urticaria due to foci of infection is usually present in some 30 per cent of the urticarial group. The infections found are chronic tonsillitis, oral sepsis, chronic sinusitis, cholecystitis, chronic colitis.

Urticaria due to drugs comprises some 20 per cent of the cases. Phenolphthalein, present almost universally in so many cathartic mixtures, aspirin, quinine, codein, cinchophen, and even ephedrin, are the drugs most often found responsible. Only a careful history will point to the responsible drug.

Food sensitivity: eggs, wheat products, meats, strawberries, fish, tomato, nuts and cottonseed oil are the important foods, although any food may be found to be the cause of urticaria. Only about 15 per cent of the patients are food sensitive and the history is of great importance plus skin tests, elimination diets and trial and addition diets.

Urticaria due to clothing and *dyes* in clothing comprises some 15 per cent of the cases (such as wool, silk or cottonseed). The substance often acts as a contactant, and here patch tests with the suspected material will often reveal the active substance causing the hives. Likewise, cosmetics having cottonseed oil and lanolin as a base may be placed in this group.

The *endocrine group* is the smallest group, forming only about 5 per cent of the cases. Urticaria may be due to menstruation, pregnancy, hypothyroidism, or the menopause. I have seen three patients with uterine fibroids who recovered completely from an intractable urticaria and angioneurotic edema following hysterectomy.

The remaining 15 per cent fall into the group of *psychogenic origin,* such as that due to emotional shock or unusual worries; or are of undetermined origin or physical allergies due to heat, cold, or light. The *treatment* is directed to the cause, and it can be readily seen that only after a thorough search and complete examination, using every possible laboratory procedure indicated plus skin tests, can these troublesome symptoms be controlled. When the cause cannot be determined, some relief may be obtained by *hyposensitizing* the patient to histamine, using very small doses and gradually increasing the amount and concentration. I have also used a histamine ointment locally on various parts of the body and, when used frequently, the ability of the skin to respond by producing hives becomes exhausted after several applications.

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Medical Clinics of North America
January, 1940. Chicago Number

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UROLOGIC CONDITIONS IN THE AGED

IT is very difficult to define old age. Some men are old when they reach sixty; others are mentally and physically active at eighty. Old age therefore cannot be assessed by the sum total of man's years. It has been stated that constant pathologic conditions are found in the aged, and that they pertain especially to the cardiovascular system, namely, degeneration of heart muscle and arterial lesions, generalized or localized. While we must admit the changes above mentioned occur regularly, it is our concept that they are physiologic changes rather than pathologic ones.

In the preface to Cowdrey's new book on Old Age, he states: "Two conflicting views are held by students of ageing in man. One considers ageing as an involuntary process which operates cumulatively with the passage of time and is revealed in different organ systems as modifications of cells, tissues and fluids; the other view interprets the changes found in aged organs as due to infections, toxines, traumas, and nutritional disturbances, which have forced cells, tissues and fluids to respond with degenerative changes and impairments." From our point of view both of these theories are tenable and do not necessarily conflict. "The guiding thread that runs through all modern study of senescence is the concept that its phenomena mark the orderly downward slope of a curve that ascended to maturity."

How does this somewhat philosophic approach to the subject affect our point of view in the care of the senile urological patient? The urologist, with the valuable aid of the physiologist, internist, and laboratory expert, has learned in the past two or three decades to evaluate quite accurately the *physical*

status of the aged patient, and has been better able to prognosticate whether or not he or she is likely to withstand the necessary surgical interference. Today, we are also better able to state when the *optimum time* for such interference has arrived. These informative data have resulted from the combined efforts of the groups above mentioned. Forward strides have also been made from the technical point of view, chiefly in regard to improved surgical procedures and in relation to the wide choice of anesthetics now available.

The introduction of *oxygen therapy,* which is so valuable in combating anoxemia in the aged, and the discovery of *insulin,* and the safe use of *blood transfusions* are among many advances which have facilitated care of the aged surgical patient. The many improved diagnostic aids, such as *intravenous pyelography* and relatively accurate *renal functional tests,* and improved technical advances in the operative field, have greatly increased the aged patient's chance of surviving necessary surgical interference. The introduction of *transurethral electroresection of the prostate* has greatly reduced the mortality and morbidity statistics among patients heretofore considered as poor risks, and its benefit particularly to those afflicted with carcinoma of the prostate can hardly be exaggerated. The transurethral attack upon bladder tumors combined with subsequent radiotherapy has contributed much to our ability to make these aged patients comfortable.. The increased use of the lithotrite, and especially the *cystoscopic lithotrite,* and the use of *spinal anesthesia,* have afforded a relatively simple method of care of bladder stones in the senile patient. It would take too long to enumerate all the technical and laboratory aids which the urologist finds useful, if not actually necessary, in his efforts to prolong the life and add to the comfort of the aged patient with lesions of the urinary tract.

Status of Cardiovascular-renal System and Lungs.—The chief difference in the care of the urologic patient who has reached old age and that of younger age groups depends not so much on the nature of the pathologic process present, though age itself brings numerical differences in the occurrence of these lesions, but on conditions due to the physiologic changes which we have recognized as important actualities and con-

comitants of senility. Since these changes affect chiefly the cardiovascular renal system and the lungs, we must show especial regard for these systems and put as little additional load upon them as is possible.

While the kidney in senility is normally smaller than in youth and middle life, the *disturbances of renal function* are determined less by the quantitative degree of functioning parenchyma than by circulatory failure and the accompaniment of similar sclerotic changes in the cardiovascular system. A disturbance within the ageing kidney which is most important follows *renal ischemia* and results in *hypertension.*

When an elderly patient requires surgical treatment of major importance, the status of the cardiovascular system must be carefully evaluated. It must be ascertained whether the heart is within the ill-defined limits of normal for the patient's years, or whether there is a pathologic condition due to *coronary sclerosis,* evidencing itself as myocardial fibrosis of a greater degree than is in keeping with the age of the patient.

The risk of operations on patients suffering from heart disease has been exaggerated in the past, and it has been our experience that cardiac patients who show no sign of heart failure tolerate major operations surprisingly well. Mortality attributed to the cardiac condition *per se* is probably less than 5 per cent. A similar percentage is approximately correct for the increased risk in the group showing hypertension. It is always necessary to balance the risk of operation in the individual case against the benefits to be derived from surgical interference. The hazard introduced by the cardiac status may contraindicate surgery when an operation of election is contemplated, but it does not do so when an emergency is to be met or operative procedures which will, if successful, add to the patient's comfort and longevity.

When eliciting the anamnesis and in examination of an elderly patient, it is important to determine whether he has shown, or at the time does show, *evidence of cardiac failure.* The question of *dyspnea* on slight exertion as well as the presence of *anginal pain* or its equivalent should be carefully determined. The presence of *slight ankle edema* is often found in aged patients with varicose veins and should not be taken as evidence of congestive failure unless general venous con-

gestion is also evident. *Nocturia,* an early sign of congestive failure, may be due only to an enlarged prostate.

The diagnosis of *hypertension* is made when the average of several blood pressure readings is above 160/90. The level of the diastolic pressure is the more important, since arteriosclerosis of the aorta alone will increase the systolic and cause little or no change in the diastolic level.

Extrasystoles in the aged may be of but little importance except in the presence of definite cardiac pathologic conditions. A *systolic apical murmur* may likewise be of no moment, and a *slight enlargement of the left ventricle* found on fluoroscopy should not be interpreted as a sign of cardiac disease in the aged.

We exclude two chief classes from the benefits of *elective surgery:* One is *frank congestive failure* or its recent occurrence, and the other is *recent myocardial infarction.*

Postoperative Care.—Postoperatively, two important sequelae must be looked for and guarded against, if possible, in the aged urologic patient: One is *acute myocardial infarction,* the other *pulmonary embolism.* Both are characterized by shock, dyspnea and cyanosis, and the electrocardiogram in both is very similar.

In the effort to prevent postoperative pulmonary embolism in the elderly patient, the following measures have been advocated: *Centripetal massage of the legs,* and *passive and active movements of the extremities,* to be carried out as long as the patient remains in bed, thus improving the venous return from the lower extremities.

The essential modifications of the usual postoperative care that pertain particularly to the aged patient are *measures to improve circulation* and *to assure proper oxygenation.* The patient should not be permitted to lie flat on his back for too long a period. Thus prolonged venoclysis is often undesirable, not only on account of the possibility of putting too much of a load on the heart, but because it necessitates the patient's lying too long in one position. The use of *inhalations of carbon dioxide* is a valuable aid in preventing atelectasis and hypostasis. If *high temperatures* supervene postoperatively, care must be taken that cardiac insufficiency does not follow, because the increased rate of 25 to 35 beats per minute causes

an overload equal to that of effort. While the heart may have sufficient reserve to withstand the added strain of operation in the absence of fever, high temperatures may cause enough additional effort to bring on cardiac failure. *Digitalis* under such circumstances may be of great value.

Hematuria.—Hematuria from the apparently normal kidney is relatively more frequent in advanced years than in younger groups of patients; the origin is, according to Israel, a diffuse nephritis. This condition is characterized by paroxysmal colics, and blood in the urine, occasionally of severe grade and often of unilateral origin. Albumin and formed elements are usually not present in the urine.

Renal and Ureteral Calculi.—The presence of renal and ureteral calculi in the aged is not uncommon; and the indications for operative interference, of course, are relatively restricted. However, the presence of calculi in the kidney tends to shorten life expectancy in these individuals. I recall clearly a patient, now seventy-three years old, who has recently been pensioned. Her general status is remarkably good in spite of the fact that she has been carrying multiple renal stones in both kidneys for at least fourteen years. In this instance, as in many others, I feel quite sure that had bilateral nephrotomy (which was the only feasible technical procedure), been undertaken at the age of fifty-nine, her condition would not have been as good as under the conservative treatment which she has received. The presence of *large bilateral renal calculi has been a contraindication in our opinion to surgical removal.* In years past we had considered these patients as fair risks, and so they are, but the results of extensive bilateral nephrostomy have been poor, most patients dying of uremia within two to three years after operation.

The surgical removal of unilateral renal or ureteral stones is indicated if the symptoms warrant; the mere fact that a patient is old is not a contraindication when the presence of stone is of greater danger to the patient's life and comfort than surgical interference. It is only reasonable that operation should be undertaken. Below we shall dilate on the general subject of the dangers of all surgical interference in the senile, which subject has often been exaggerated.

Renal Tuberculosis and Tumors.—Renal tuberculosis

may be rather quickly dismissed, as its presence in the aged is quite uncommon. Renal tumors likewise are not frequently encountered in the aged. Among 1800 autopsies on aged individuals at the Vienna Pathological Institute, no case of primary renal carcinoma was found.

Pyelitis and Pyelonephritis.—Pyelitis and pyelonephritis are relatively common in the aged, usually resulting from ascending infection from obstructive bladder lesions with concomitant cystitis. In the aged woman, lesions of the uterus and parametrium, especially carcinoma and its extension, serve as the etiologic factor for the pathologic conditions. However, narrowing of the urethral meatus and of the urethra *per se* is a frequent cause of upper urinary tract infections, as are also prolapse of the uterus and uterine fibroids. Pyelitis and pyelonephritis are on the average two to three times as frequent in the aged man on account of obstructive vesical neck lesions.

Hydronephrosis and Pyonephrosis.—Hydronephrosis and pyonephrosis in the aged differ from the same conditions as observed in younger individuals, chiefly because sources causing unilateral hydronephrosis and pyonephrosis produce their results much before the onset of old age and, therefore, unilateral lesions are less often encountered in the senile.

On the other hand, obstructive lesions of the bladder neck, prostatic hypertrophy and carcinoma, stone and contracture of the vesical neck in the male, and lesions of the genital tract in the female, which are causal of bilateral hydronephrosis, are common after the sixth decade, and thus bilateral lesions are relatively frequent. Ureteral kinks, stone, and carcinoma of the bladder are additional causes for the presence of hydronephrosis in the aged. As is true of pyelitis and pyelonephritis, hydronephrosis is more common in the aged man than in the aged woman, while this relationship is reversed in younger individuals of the two sexes.

Para- and perirenal infections are uncommon in the aged.

Bladder and Prostatic Conditions in the Aged.—Obviously the greatest number of lesions of the bladder in aged men are due to hypertrophy of the prostate, and for the sake of brevity the concomitant lesions of the prostate gland and urethra will be only mentioned. You are all too familiar with this phase of urology in the aged male to make it necessary

to enter a long discussion of the pathologic physiology of bladder neck obstruction. As you know, lesions of the bladder neck, especially prostatic hypertrophy, gradually produce an obstruction to which the bladder can at first accommodate itself by hypertrophy of the detrusor muscle.

After an indefinite period of time, however, the bladder musculature can no longer empty the viscus by its own force and eventually it becomes incompetent much as the musculature of the heart does in the presence of valvular lesions, when its myocardium becomes weakened and fibrotic. When the phenomenon of vesical decompensation occurs, the ureteral orifices dilate and reflux into the ureters occurs. In the presence of infection, the infected bladder urine is forced up into the ureter and, coincident with this occurrence, dilatation of the renal pelvis is usually demonstrable. Even before complete decompensation of the detrusor muscle has occurred, the renal function is impaired and excess of nitrogenous end products in the blood is found on blood chemical examinations.

When the renal insufficiency is due entirely to back pressure, and is secondary to pathologic conditions at the vesical neck, the outlook for these old men is much better than when this condition is superimposed upon a chronic glomerular nephritis or upon arteriolar sclerotic changes in the kidneys. For this reason, and for many others as will be shown later, the preoperative care and evaluation of the aged patient are so necessary to obtaining the best results of operative treatment.

The persistent use of the *inlying urethral catheter,* when well tolerated, is of tremendous value in the care of the patient with poor kidney function. Of course, the same benefit may be obtained by preliminary cystotomy, but often with more risk. Ten years ago we operated upon an old man of eighty-nine years and nine months. He retained comfortably an inlying catheter for over six weeks. The catheter was changed daily. During this period his kidney function, blood pressure and blood count had markedly improved, so that they closely approached the normal. A one-step suprapublic prostatectomy was done and a huge prostate, weighing over 400 gm., was removed. The operation was done under spinal anesthesia. This patient made a complete and satisfactory recovery and his convalescence was not marked by a single untoward symp-

tom. He died recently, a few months before his one hundredth birthday.

The addition to the staffs of larger hospitals of expertly trained medical specialists in the field of anesthesia has been of incalculable value in the care of the aged urologic patient. Last year for the first time in my experience a patient of mine showed alarming bleeding after the removal of a pack from the prostatic bed, after a second step prostatectomy. He had been bleeding profusely for some time before I could take him to the operating room to insert another pack. His condition on the table was very poor and his blood pressure was below 90 systolic. The anesthetist gave him oxygen during the short operation, and he was given oxygen while on the elevator from the second to the sixth floor of the hospital. An oxygen tent had already been prepared and was functioning at the bed. There was no interruption of oxygen therapy. Two transfusions of 500 cc. of citrated whole blood were given in the afternoon, and from that time the patient progressed favorably and steadily to complete recovery.

This experience conclusively shows to my mind the *value of oxygen therapy* and *blood transfusions,* and I feel that the patient's life was saved as a result of the clear thinking and persistency of our anesthetist, Dr. Lennon.

Atony of the bladder in the absence of obstructive uropathy is of sufficient frequency in the senile to warrant emphasis.

The association of *neurogenic bladder disease,* especially in tabes dorsalis, with obstructive lesions at the bladder neck, is not a rare finding. While often difficult to evaluate the exact weight of each component, I have never, thus far, regretted removing the vesical neck obstruction, usually by transurethral resection. In most instances the results are unexpectedly good.

A seeming paradox is noted in the care of aged urologic patients: because of their age and the physiologic degenerative changes always present, they superficially appear as poor risks for necessary surgical treatment. However, the fact that they have withstood the physical and mental traumas of seven or eight decades shows that they are made of "sterner stuff" and that they are likely with intelligent preoperative and postoperative care to withstand necessary surgery.

Medical Clinics of North America
January, 1940. Chicago Number

CLINIC OF DR. M. EDWARD DAVIS

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THE TECHNIC OF THE GYNECOLOGIC EXAMINATION

IT is impossible to consider local examination of the pelvic organs apart from the general physical examination. Pathologic conditions in the pelvis so often represent the local manifestations of a more general condition. Symptoms referred to the pelvic organs may be the result of pathologic processes far removed. Disease of the reproductive organs may have far-reaching repercussions. Thus, although only the gynecologic examination can be discussed at this time, *one must not lose sight of the patient as an entity* and interpret local findings in their general relationships.

Every medical examination must include certain *laboratory diagnostic procedures*. Every patient should have complete blood and urine examinations. The Wassermann or Kahn examinations for the presence of syphilis must likewise be performed routinely. The problem of syphilis has attained such prominence in the past few years that no physician should miss an opportunity to determine the presence of active or latent syphilis. Special laboratory procedures of all kinds may be necessary to establish a diagnosis or to determine appropriate treatment. Such procedures are no different in the patient with pelvic disease than in other patients.

A definite routine must be followed in the gynecologic examination in order that it may be thorough and complete. The essential and detailed *history* usually indicates the nature of the pelvic complaints and directs attention to some particular phase of the investigation. However, serious pathology will be overlooked if the examination is not carried out in a systematic manner.

Abdominal Examination.—Abdominal examination must precede the pelvic investigation. Obviously many disease processes having their origin in the pelvis can be discovered on abdominal examination. The presence of an ascites will direct attention to a possible malignant ovarian neoplasm, although the local findings may be rather indefinite. An abdominal tumor at the brim of the pelvis may arise in the pelvis, being attached to its local site of origin by a long pedicle. On the other hand, a tumor of the lower abdomen and pelvis which is discovered on pelvic examination may be a large diseased kidney or even a splenic tumor. It is not uncommon for patients to complain of lower abdominal pain which they refer to their genitalia when, in fact, this discomfort has its origin in the gastro-intestinal tract, such as a colitis. The pelvis and its structures must not be divorced from the patient as a whole for grave mistakes may result.

Pelvic Bones, Spine, and Ligaments.—The pelvic bones, spine, and the ligaments which bind them together, may be the site of one of the most common of gynecologic complaints: *backache.* Although most patients refer their aches and pains in the back to their pelvic organs, these do not often contribute to backache. Sacro-iliac disease, changes in the pelvic joints which follow pregnancy and delivery, and arthritis are much more common causes of backache in women than are malpositions of the uterus. Properly to evaluate this important and common symptom, the back and pelvis must be thoroughly investigated.

TECHNIC OF PELVIC EXAMINATION

The pelvic examination should be made with the patient's legs in stirrups and with the buttocks at the edge of the examining table. She should be unclothed, at least to the waist, and properly draped. It is well to have a nurse or an attendant present during the examination. Anything that is done to put the patient at ease, so that she is thoroughly relaxed and comfortable, will contribute to the accuracy and the value of the examination. Little information as to pelvic pathology can be gleaned from the patient who is squirming and writhing all over the bed or the examining table. Daylight or a good source of artificial light is essential.

The *distribution of the hair* should be noted. In the typical feminine pattern, the pubic hair line is transversely across the lower abdomen, leaving the abdomen free of hair. The masculine hair pattern forms a triangle with its apex at the umbilicus. A marked hair growth may be present on the thighs, the buttocks, and on down the legs. Excessive hair growth in these regions may be associated with endocrinal abnormalities, manifesting themselves clinically in irregularities of menstruation, sterility, and other functional disturbances.

External Genitalia.—The external genitalia should be carefully inspected. The normalcy and the development of these structures have important relationships to gynecologic conditions. These secondary sex characters may have failed to develop as a result of the immaturity of the individual. They may thus retain their prepubertal appearance. Women with primary amenorrhea often exhibit a lack of development of these external genitals. The social status of the patient may indicate the state of the vulval structures. In the virginal state, the hymenal membrane should be intact, although its opening may easily admit the examining finger for examination. The marital introitus will be indicated in its increased roominess and the evidences of trauma, relaxation, or almost complete obliteration of the hymenal ring.

The *urethra* and the *vulval glands* are most often involved in lower genital tract infections, particularly of gonorrheal origin. The urethra should be inspected, its lowermost portion carefully palpated and stripped to determine the presence of purulent secretion. Skene's and paraurethral glands can likewise be inspected and palpated when abnormal. Bartholin's glands, present in the labia majora, can only be palpated when they have become enlarged and grossly altered by disease. The superficial openings of their ducts are visible only during an acute inflammation of these glands. Chronic inflammatory conditions result in hard indurated glands, the size of a pea or larger, or in cystic swellings in the labia.

The urethral mucosa may gape through its orifice. Such prolapse of the urethra may cause urinary difficulty. Urethral caruncle or polyps may likewise account for dysuria or urinary frequency. These pathologic conditions can be diagnosed by simple inspection, although it may be well to sound the urethra

and occasionally to pass a metal catheter into the bladder, at the same time obtaining a sterile specimen of urine for microscopic examination or culture.

The marital *introitus* should easily allow the introduction of the two examining fingers. In the parous patient, the integrity of the *perineum* should be noted. It may be moderately relaxed but functionally competent. It may have been lacerated at a previous childbirth—moderately or severely, thereby seriously interfering with necessary function. The trauma may have extended to involve the anal and rectal sphincters, resulting in a partial or more complete loss of sphincter control in this region. The perineum may appear intact on superficial examination, but its function may have been impaired by the formation of a *rectocele*. This herniation may be better demonstrated when the patient is asked to strain as at stool, thereby imitating functional conditions. The extent of the pathology of the perineum is not always reflected in the symptoms of the patient. Some women may not be aware of a widely gaping vulval orifice as a result of a huge rectocele and cystocele, whereas other women complain of moderate perineal relaxation and moderate rectocele formation. A herniation of the lowermost portion of the rectum may result in the inability of the patient to empty the lower bowel and predispose to constipation. Rectal or rectovaginal examination will help to determine the integrity of the perineum and will demonstrate the extent of a rectocele.

The integrity of the *anterior wall of the vagina* should be noted. Childbearing may result in trauma to the supporting structures of the bladder, allowing this organ to prolapse the vaginal wall forward into the vulval orifice. Small cystoceles may give rise to no symptoms unless they produce small sacculations of the bladder. Larger cystoceles usually produce urinary frequency, incontinence and occasionally dysuria.

The *walls of the vagina* should be palpated and later inspected. The vaginal mucosa varies widely at different periods in life and as a result of pathologic conditions. Cellular smears of the vaginal lumen and small vaginal biopsies are accurate indicators of *ovarian activity*. They can be used in the control of hormonal therapy in the menopause and in amenorrhea of

young women. Postmenopausal vaginitis can be diagnosed by visualization of the vaginal walls.

The *etiology of a genital tract infection* must be determined in order to institute the proper treatment. Smears should be made from the urethral, vaginal and cervical discharges. Smears should be made from Skene's glands if they are involved. Gram's stain will establish the presence of gram-negative intracellular diplococci in *gonorrheal infections*. Gonococci can be grown on special culture media, and in some cases this procedure may be desirable. *Trichomonas* should be suspected in the presence of a foamy, bubbly, purulent discharge. These organisms are easily demonstrated in a hanging drop. *Fungus infections* of the lower genital tract produce an abundant cheesy secretion. The *Monilia* can be demonstrated on a stained slide, but culture methods are more accurate. Indurated, ulcerating lesions of the cervix suspicious of a *chancre* should be subjected to a darkfield examination of the secretion for spirochetes. The blood Wassermann and Kahn do not become positive for some weeks after the initial chancre.

Uterus.—The uterus must be considered clinically as consisting of three distinct parts. In the examination of this organ several diagnostic procedures are available. The entire uterus can be palpated by bimanual examination in most patients. Occasionally, in the obese or when the patient cooperates poorly because of nervousness or great discomfort, it may be impossible to outline the uterus on palpation.

The *relationship of cervix* and *corpus* should be noted. Normally, the cervix points in the axis of the vagina, and the body of the uterus is anterior and behind the pubis, thus maintaining moderate flexion. The relationship of the uterus and the pelvis should likewise be ascertained (Fig. 22). Recent studies indicate that the uterus has a wide range of mobility in the normal female and its position is altered considerably with postural changes and altered environmental relationships. Its supporting ligaments, however, facilitate the return to the usual position. *Retrodisplacements* of the uterus may be temporary or permanent and may vary in degree. Permanent retrodisplacements usually involve an altered relationship between the corpus and cervix, eliminating the anterior flexion

and in extreme cases substituting posterior flexion. The direc tion of the cervix may provide a clue as to the position of th corpus.

Examination should reveal whether the retrodisplacemen is permanent and as a result of inflammation of uterine sup

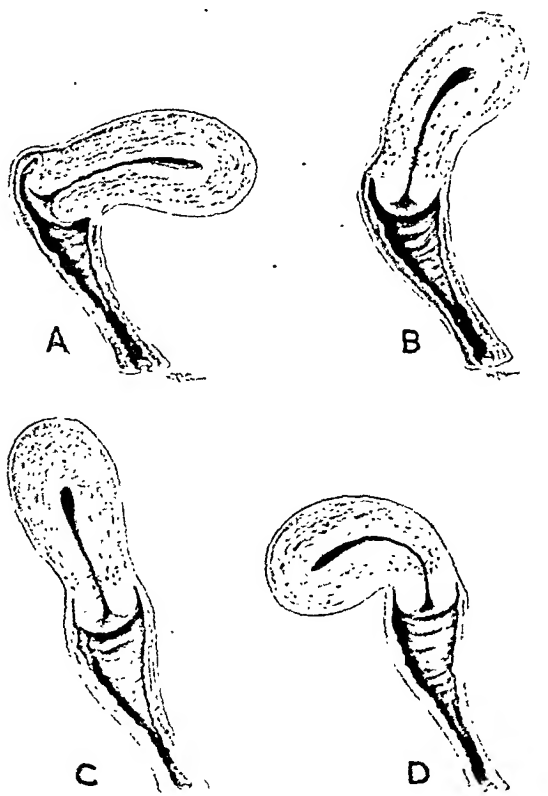

Fig. 22.—Although the uterus normally has considerable mobility, the relationship of the uterus to the vaginal axis and the environmental structures is important: *a*, abnormal anterior position; *b*, normal position; *c*, retrodisplacement; *d*, complete retrodisplacement, retroversion and retroflexion.

ports, adnexa, or environmental viscera. *Neoplasms* of the uterus or ovaries may dislodge the corpus from its usual position. Such malpositions are not easy to correct by manipulation and pessary support. The *simple retrodisplacement which*

follows childbirth can usually be replaced on pelvic examination and the maintenance of the normal position favored by suitable pessaries. The abnormal positions of the uterus caused by an inflammation or neoplasms of the adnexa or uterus can only be restored to the normal by operative intervention. Obviously, the uterus will return to the usual position if a tumor which has dislodged it has been removed.

Retrodisplacements of the uterus may or may not produce symptoms. In many instances such a condition is an accidental finding and needs no therapy. Retrodisplacements associated with other pathology or adherent retroversions may produce *backache, dysparcunia, vesical irritability, constipation,* and *other disturbances.*

The *replacement of an uncomplicated retrodisplaced uterus* can be accomplished by *bimanual manipulation.* If this procedure is not successful, a properly fitting Smith-Hodge *pessary* may be placed in situ and the patient instructed to assume the knee-chest posture several times daily. These exercises and the favorable leverage provided by the pessary will most often correct the malposition.

Bimanual replacement is occasionally aided by the use of a *volsellum forceps* on the anterior lip of the cervix. The cervix is carefully pulled forward and downward at the same time that an attempt is made to bring the body of the uterus anterior. Manipulation should be carried out with great care so as to spare the patient too much discomfort. When the uterus has been brought anterior, a pessary will help maintain this normal position.

Bimanual Examination.—Bimanual examination will reveal the size of the uterine corpus, its symmetry, its consistency, and its relative position in the pelvis. The symmetrical enlargement of the uterus, particularly when its consistency is softer than normal, may indicate the presence of a *gestation.* An irregular, nodular enlargement usually is produced by *fibromyomata.* It may be difficult to outline accurately the size of the enlarged uterus, for it may merge indistinctly with an adnexal tumor such as an *ovarian cyst.* When the uterus is located posteriorly in the pelvis, *rectovaginal examination* may provide additional information. The consistency of tumor nodules and their mobility in relation to environmental pelvic

structures are important considerations in the diagnosis and treatment.

That portion of the uterus which protrudes into the vagina and can be visualized on speculum examination is known as the *portio vaginalis* and is of prime clinical importance (Fig. 23). Superficially, it is covered by a continuation of the squamous epithelium which covers the vagina. This is the most vulnerable locality for cancer, so that squamous cell carcinoma of the cervix is the most frequent genital cancer. The cervical canal from the external to the internal os contains the mouths of simple glands which penetrate the stroma of the cervix for

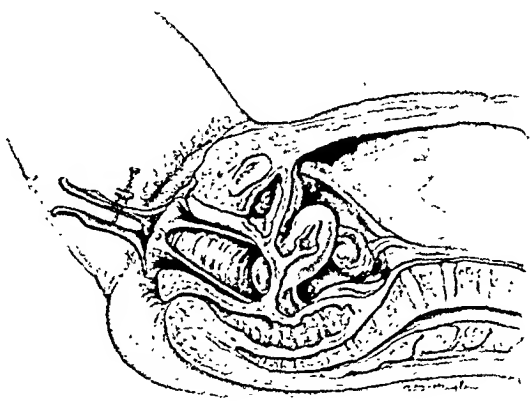

Fig. 23.—Speculum examination reveals the vaginal walls and the vaginal portion of the cervix, a most common site of disease.

a considerable distance. These glands, lined by a mucus-producing cervical epithelium, are most often subject to infection, but rarely does cancer involve this area. The cervix is always traumatized during labor. Rarely it recovers completely; more often minor lacerations occur; occasionally extensive lacerations result in severe mutilation of this structure. Trauma invites infection, which develops a marked chronicity in this locality.

The accessibility of the *cervix* to palpation, direct inspection, and biopsy, and the frequency and serious nature of cervical pathology, increase the importance of a most careful

examination of this vulnerable portion of the uterus. *Palpation* should give the size and normalcy of the cervix, the presence of lacerations, and pathologic lesions. Induration in and about a lesion is present in the primary stage of syphilis and in the carcinomatous ulcer. The cervix in pregnancy develops a characteristic softening almost pathognomonic. Evidences of cervical trauma as a result of previous pregnancies or surgical intervention can be palpated before the cervix is visualized.

Speculum Examination.—Speculum examination must be carried out at every opportunity so that the cervix can be carefully inspected. The instrument will not cause pain if it is not too large for the patient, if it is well lubricated, and if it is introduced in an oblique manner so that it does not make pressure against the urethra. The mucus can be sponged away so that the cervix can be clearly visualized. Erosions are very common. They do not bleed easily. Nabothian cysts may appear as small translucent, slightly raised areas. A small polyp may protrude from the cervical canal. Lesions which are not typical or which bleed on manipulation, ulcerations, or proliferating growths must be biopsied and submitted for histologic examination. The *cervical canal* should be carefully probed with a cotton applicator and a small probe. Careful examination of this portion of the cervix should not provoke bleeding. Cavitation is indicative of cancer of the endocervical portion of the uterus.

Colposcopic Examination.—Colposcopic examination has been introduced in recent years to aid in uncovering very early malignant lesions. The examination of the cervix by greatly increased magnification has yielded little additional information. Clinically, the use of the colposcope is rather limited to large clinics with specially trained personnel.

Schiller's Test for Cancer of Cervix.—Schiller's test for cancer of the cervix is only of relative value. It is based on the fact that the normal squamous epithelium of the portio vaginalis is rich in glycogen and can be stained a mahogany-brown by an iodine solution. Carcinoma cells, as well as other pathologic lesions, fail to take the stain because of the lack of glycogen, thereby remaining yellowish in color. These areas which do not stain stand out discretely against the dark brown background. Thus, staining the cervix with Schiller's solution

emphasizes the abnormal areas which may or may not be malignant.

Biopsy of Cervix.—A suitable biopsy of the cervix is the best guarantee as to the nature of a suspicious lesion. It should be carried out in the hospital with the use of some form of anesthesia. The biopsy specimen should consist of a wedge-shaped section and include portio vaginalis and endocervix, for the vast majority of cancers begin at the junction between squamous and columnar epithelium. A single stitch or two will

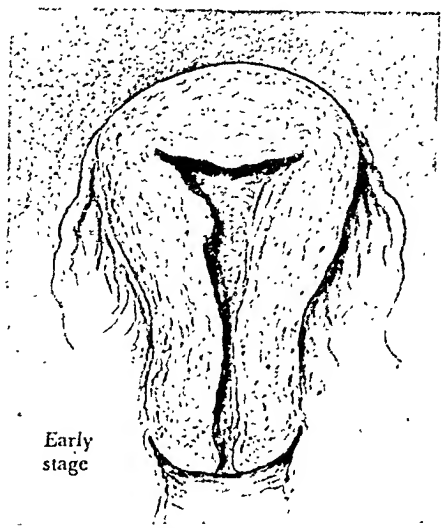

Fig. 24.—An early adenocarcinoma of the cervix which produced irregular bleeding and could only be diagnosed by dilatation of the cervical canal and diagnostic curettage.

control the bleeding and provide for accurate approximation of the cut surfaces. An experienced pathologist can make an accurate diagnosis as to the nature of the excised tissue. It is far safer to biopsy a suspicious lesion than to await developments. Cancer of the cervix must be recognized in its early stages and the careful examination of all lesions will uncover many early neoplasms that can then be treated with excellent results (Fig. 24).

Dilatation and Curettage.—The uterine corpus can only be explored indirectly. Dilatation of the cervical canal pro-

vides access to the uterine cavity. It can be sounded and the endometrium removed by means of a sharp curette.

Diagnostic curettage is one of the most important gynecologic procedures. It is the only method available for the diagnosis of carcinoma of the corpus and endocervix at an early stage before a lesion has produced gross enlargement of the corpus. Every patient near the menopausal age who has prolonged menstrual flow, irregular periods of bleeding, or bleeding between the periods and who on examination is found to have normal pelvic organs, should have a dilatation and curettage. Every patient in the menopausal period who has bleeding at irregular intervals should have a diagnostic curettement. Lastly, every patient in the postmenopausal period who begins to spot, bleeds after a douche or following coitus, and who on examination is found to have no obvious cause for this bleeding, must be subjected to curettage. *Bleeding in the postmenopausal period is always of serious pathologic import,* and in the absence of visible or palpable pathology sufficient to account for the bleeding it is usually due to cancer of the uterine corpus. It is justifiable to subject a hundred women to a diagnostic curettage in order to uncover one patient with an early carcinoma of the corpus easily amenable to therapy.

Diagnostic curettage is occasionally carried out in young women with irregular periods or profuse bleeding. Pathology of the endometrium, such as a marked hyperplasia with polypoid changes, may be demonstrated. Small submucous fibroids not discernible on palpation may be found on exploration of the uterine cavity. Pathology associated with gestation, such as an incomplete abortion, may be diagnosed and, incidentally, treated by dilatation and curettage. This simple operative procedure is of greater diagnostic value than any other procedure in our gynecologic armamentarium and it should be used freely.

Adnexa.—The adnexa, fallopian tubes and ovaries lie alongside the body of the uterus (Fig. 25). Normally they are freely movable and only the ovary can be palpated with ease. In obese women neither adnexa can be felt. The ovary can be brought into the proximity of the examining fingers by pulling the uterine corpus toward the opposite side. Pathologic conditions involving the tubes or ovaries increase their size, limit

their mobility, and cause pain on palpation. Thus in the presence of pathology the involved adnexa are more easily outlined.

Inflammatory conditions involving the fallopian tubes cause adnexal masses lateral to the uterus. During the acute stage a brawny, indefinite induration involving most of the structures in the pelvis may hide the pelvic organs. As the disease becomes subacute in character, discrete adnexal masses may be palpated lateral to the uterus, occasionally posterior to it. These inflammatory structures may be much larger than the uterus. Movement of the uterus is markedly restricted and exceedingly painful. In the chronic stage the adnexa may be palpated as small discrete masses lateral or posterior to the

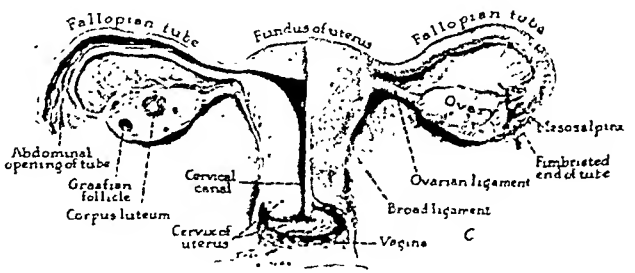

Fig. 25.—The clinically important structures in the reproductive organs, the normalcy of which can be ascertained by palpation and speculum examination.

uterus, adherent to it or to the environmental structures and painful to deep palpation.

The *ovary* may be enlarged, somewhat elastic, but freely movable. Such enlargements are usually due to follicle cysts, which are of little clinical significance. A tumor may be palpable lateral, anterior, or posterior to the uterus. It may be solid or cystic. If freely movable it is probably an ovarian neoplasm on a pedicle, part of which comprises fallopian tube and mesosalpinx. If it appears firmly fixed in its location, it may be intraligamentous in its attachment. Solid ovarian neoplasms are often bilateral and malignant. Nodules palpable in the cul-de-sac and an irregular nodular ovarian tumor are usually indicative of ovarian carcinoma.

Special Studies.—Special studies may have to be carried

out in the investigation of some gynecologic problems. The diagnosis of the causes of *irregularities of menstruation,* the *lack of normal development of the reproductive organs,* and the *failure of conception* to take place necessitate special procedures.

Endocrine studies are long and painstaking and expensive to undertake. They can only be carried out in institutions having suitable laboratory facilities.

The simplest of the procedures is the *basal metabolic determination.* This evaluation of thyroid function is an important adjuvant to the treatment of gynecologic complications. Hypothyroidism is often associated with irregularities of menstruation, inability to carry a gestation to a successful conclusion, and sterility.

It is more difficult to obtain fairly accurate hormone assays from blood and urine. The determination of *estrogenic, androgenic,* or *gonadotropic blood levels* can only be carried out in biological laboratories. Indirect evidences of *pituitary* and *ovarian function* can be obtained by a study of the endometrium, which mirrors the changes in these endocrine glands. Small biopsies of the endometrium can be obtained by a special suction curette or by means of a small punch. This is an office procedure which can be carried out with little discomfort. Such a biopsy, taken near the onset of menstruation, will reveal the endometrium in the secretory phase in the event that ovulation and normal development of the corpus luteum has occurred. Vaginal biopsies can be used to study the estrogenic activity. The presence of corpus luteum activity can now be demonstrated by the quantitative chemical determination of *sodium pregnandiol glucoronidate* in the urine, a product of progestin metabolism.

INVESTIGATION OF THE STERILE COUPLE

In planning the study of a sterility problem, a complete and detailed history of each of the partners is important. This should include, specifically, all available information concerning their development, general constitutional diseases, operations, the onset and character of puberty, and any possible genital infections. A careful history of the menses should be obtained, with data covering the frequency, duration, amount,

and associated symptoms, as well as information concerning any abnormalities which may have occurred. The use of contraceptives and their type should be determined. The habits of the couple concerning intercourse should be investigated, particularly in regard to frequency and time interval during the ovarian cycle. The course of any previous obstetric episodes, such as abortions, either intentional or unintentional, should be determined and the history of previous deliveries, particularly in regard to complications, should be obtained.

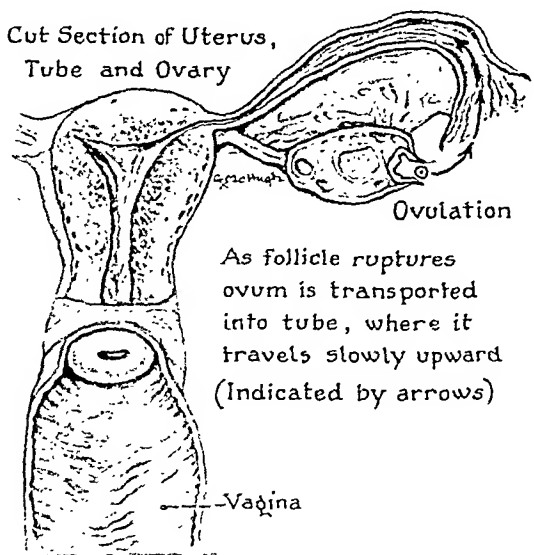

Fig. 26.—Diagrammatic representation of the female reproductive tract, showing ovulation.

Both husband and wife should then have a careful general physical examination which should be supplemented by complete local examination of the reproductive tract as previously outlined.

These general procedures are followed by a group of *special examinations* designed more adequately to evaluate the structural and functional abnormalities which may be present. The *patency of the reproductive tract* in the female must be definitely determined (Figs. 26–28). This may be accom-

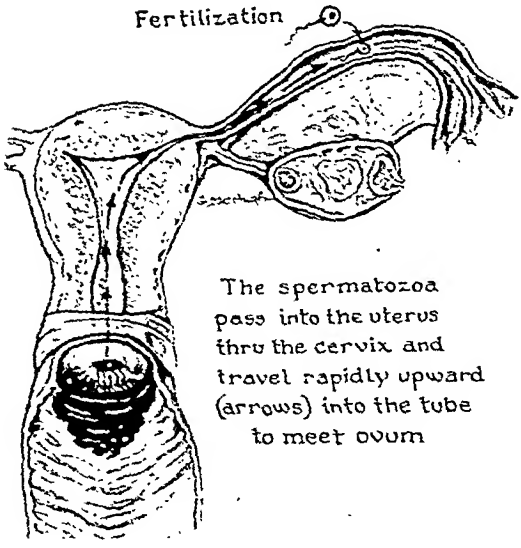

Fig. 27.—Diagrammatic representation of the female reproductive tract, showing the course of spermatozoa into the tube and fertilization.

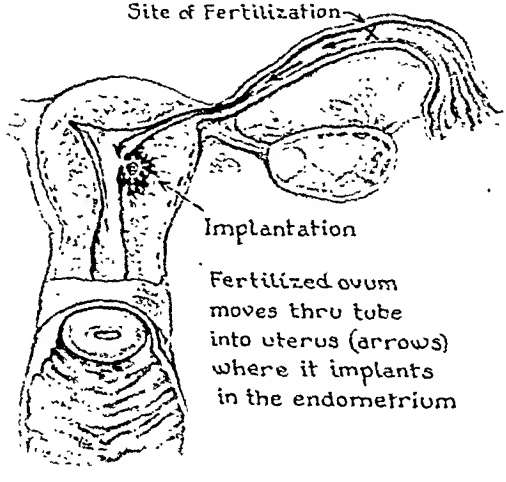

Fig. 28.—Diagrammatic representation of the female reproductive tract, showing the transport of a fertilized ovum and its implantation.

plished by the insufflation of the tubes with carbon dioxide or oxygen gas as described by Rubin. This procedure is readily performed in the office and, when combined with a graphic representation of the pressure changes, gives very valuable information.

The *Rubin test* is done by inserting an olive-tipped cannula into the cervical canal so that a leak-proof passageway into the uterine cavity is obtained. The gas at a controlled low pressure is thus allowed to flow through the apparatus into the reproductive tract. The pressure is allowed to rise gradually until, in the presence of normally patent tubes, it drops rapidly as it flows into the peritoneal cavity. If there is obstruction to the flow of gas, the pressure in the reproductive tract continues to rise and should never be allowed to exceed 200 mm. of mercury. The free passage of the gas is at times prevented by tubal spasm, and in such instances the test may be repeated following preliminary atropine medication. In addition to the information obtained by changes in the pressure of the gas and its graphic recording, passage of the gas into the peritoneal cavity is recognized by the occurrence of shoulder pain as the patient assumes an erect position, and it may be seen at fluoroscopic examination as a subdiaphragmatic gas bubble. Auscultation over the tubal areas also reveals the passage of gas through the tubes.

Direct visualization of the reproductive tract by means of *injection of iodized oil under the fluoroscopic control* offers the advantage of more definite localization of an obstructing lesion and completely outlines the uterine cavity as well as the tubes. Immediate stereoscopic roentgenograms with twenty-four-hour follow-up studies give a permanent record and aid in accurate evaluation of the patency of the tract. It has been our practice to perform the Rubin test and to follow it immediately with *hysterosalpingography* (Fig. 29). Using the same cervical cannula, 6 to 10 cc. of iodized oil are slowly injected into the uterine cavity under fluoroscopic control. The filling of the uterine cavity and extension of the oil into the tubes is readily seen (Fig. 30). In normally patent tubes the oil can frequently be seen to spill from their fimbriated extremities. The patency of both tubes is in this way readily demonstrated as is the failure of the oil to spread normally. The examination

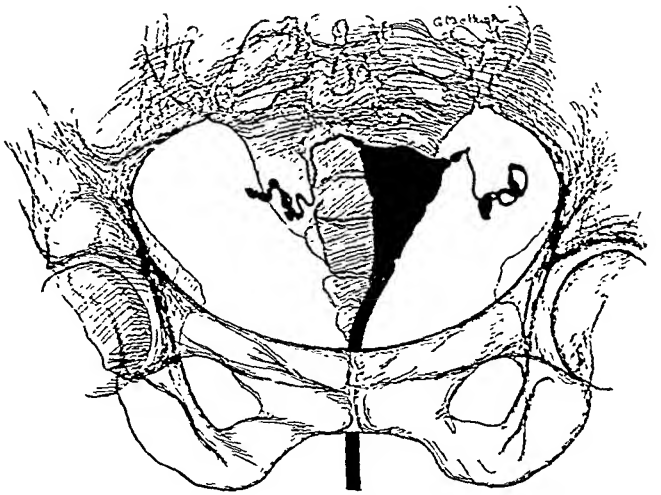

Fig. 29.—Normal hysterosalpingogram. Both tubes are completely filled, with beginning spill on left. Cornual sphincters at both tubes can be seen easily.

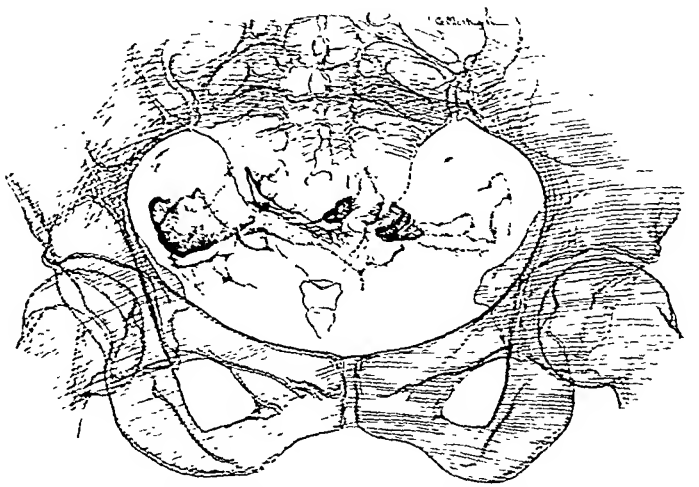

Fig. 30.—The same patient as Fig. 29 after the injection of opaque medium into the uterus. A typical spread of the oil on the pelvic viscera and peritoneum can be seen.

is completed by obtaining the two sets of stereoscopic roentgenograms previously mentioned.

Neither the Rubin test nor hysterosalpingography should be performed *if there is any evidence of an active inflammatory disease in the pelvis,* as they frequently will produce an acute exacerbation of the process. Both tests should be done during the first half of the ovarian cycle, as subsequent to ovulation there is always the possibility of pregnancy and because the tubes are less readily patent during the second half of the cycle. Gas may be forced into the circulation during the performance of the Rubin test, and oil under pressure may extravasate into the uterine wall and enter the lymphatic or venous channels. Neither accident is of serious consequence in the majority of instances.

It is important that the remainder of the study be completed even though the previous examinations have shown sufficient abnormality to prevent conception. In no other way can all of the factors be evaluated and intelligent treatment undertaken.

The *Hühner's test,* or postcoital examination of the female, offers an opportunity to study the spermatozoa in the environment to which they are subjected during their passage into the uterine cavity. Living spermatozoa should be present in the vaginal and cervical canals for a period of at least two hours following intercourse. Their number and activity should be determined by microscopic study of fresh specimens obtained from these two sources. They are fewer in number, but often more active in the specimen obtained from the cervix. If motile sperm are not found in abundance at the Hühner's test, a warm condom specimen of semen or the fluid obtained following prostatic massage should be examined. Consultation with the urologist specially trained in this field may well prove of value in any doubtful case.

The investigation is completed by study of the *endocrine factors* which may be involved. The basal metabolic rate of both husband and wife should be determined. Valuable information concerning the occurrence of ovulation and corpus luteum formation is obtained by biopsy of the endometrium during the days just preceding a menstrual period. In suspected endocrine disturbances, as suggested by the history of

irregular or otherwise abnormal menses, or by the general physical condition of the patient, hormone studies of the blood may be of value. These are tedious and require expert technic for accurate assay, and they must be continued over a long period of time to be of significance so that they properly should be delegated to those equipped for the study. Recent work of Brown and Venning indicates that the assay of the urine for *pregnandiol,* an excretion product of progestin, may prove to be an accurate index of corpus luteum activity and a satisfactory method of determining the time of ovulation.

The gynecologic examination is occasionally incomplete without an examination of the environmental viscera. A *cystoscopic* or *proctoscopic* study may reveal the cause of unexplained symptoms.

Medical Clinics of North America
January, 1940. Chicago Number

CLINIC OF DR. EARLE GRAY

PRESBYTERIAN HOSPITAL

TREATMENT OF GRIPPE, INFLUENZA, AND THE COMMON COLD

THE treatment of the common cold is a subject like the weather: everyone talks about it but no one does anything effective. Most people, whether doctors or laymen, have their own special treatments.

The common cold, which may include most of the acute respiratory inflammations and infections due to various bacteria and viruses, is the most common ailment of mankind and is the greatest single cause of lost time in industry. For this reason *prevention* is of interest in considering the treatment.

Prevention.—Without having definitely proven the etiologic organism of the cold, we are yet generally agreed that most respiratory diseases are both contagious and infectious. We are all familiar with epidemics in schools, families and industrial organizations, and we are especially familiar with the definite influenzal epidemics and their continental spread.

Isolation of the sick person is therefore the first canon of treatment. To be effective this isolation must be early in the course of the illness when apparently infectivity is strongest. This type of isolation has been found to be efficient in schools where trained observers detect early symptoms. Frequently isolation comes too late; for apparently the period of infectivity is early in the disease. Patients with colds should have all personal clothing and utensils thoroughly sterilized. The use of masks in this isolation program is of questionable value and where used, these should probably be reserved for the victim of the cold rather than the attendant. The use of gargles and sprays as preventive measures is of doubtful value. The period of this isolation is not as well established as it is in the more

dramatic contagious diseases, such as measles, chicken pox or mumps, but it should at least cover the period of the patient's fever.

For the individual patient certain *hygienic measures* are included in "taking care of oneself" which may help to prevent contracting the disease. These are repeated over and over: "Avoid fatigue, over-eating, exposure to cold wet weather," until they have come to lose their force and like the cry, "wolf, wolf," bring no response; yet all of us know people who have learned that such measures of precaution help to keep them well. There are individual variations in susceptibility and one who over-eats with impunity may be made ill from wet feet. Certainly a well-balanced diet with sufficient natural vitamin carriers helps establish resistance to infections. Exposure to ultraviolet light, either natural or artificial, is thought to be of value.

Our experience with *vaccines* as instruments of immunization has not lived up to our expectations. Many well-controlled experiments examined critically show no advantage derived from present methods of vaccination. Occasionally an autogenous vaccine seems to prevent recurring colds in an individual. Conclusions drawn from such isolated experiences, however, are not safe guides and are not supported by studies in large controlled groups. Hope here ever recurs and some investigations in the immunologic field may yet be crowned with success.

Work reported from the University of Illinois Medical School by Dr. George Wakerlin in the recent past has suggested that each individual undergoes a recurrent cycle of susceptibility to respiratory infections. The cycle has a period of about three years, and during this time the body builds up immunity which is marked by a period of relative freedom from respiratory infections and this free period is followed by a high morbidity. Perhaps future work on this line will offer the individual patient a guide by which he may learn to protect himself during periods of low resistance.

Treatment of the Individual Patient in the Acute Phase.—For the care of the individual patient we have no treatment better than that outlined by Dr. James B. Herrick in his paper, published in the Journal of the American Medi-

cal Association in 1919, on "The Treatment of Influenza."[1] This grew out of his experience in two epidemics. This treatment consists of *bed rest* during the course of the acute illness, and *other therapeutic means to control symptoms as they arise.*

Do not over-treat except possibly in the matter of bed rest. The *period of rest* should continue for three days of normal temperature. After this period the activity of the patient should be increased gradually. During the period of bed rest the patient must be kept happy and comfortable, and it is in this phase of the treatment that you must use your greatest ingenuity. It was possible for me at one time to follow closely the treatment of patients of five outstanding internists and to observe the widely varying methods of obtaining comfort for the patient. Bed rest was a therapeutic measure common to all, but the symptomatic therapy offered these men a wide range for the use of their talents in the art of medicine. The results obtained by the men were uniformly good.

Warmth is one of the prime requisites for the comfort of the patient. *Warm moist air* is generally desirable. The moisture may be obtained in various ways, the most common being the steam kettle, although there are now elaborate electric appliances that are the equipment of most modern hospitals. Another effective means of obtaining moist warm air is by the use of moist blankets over the radiator or a bath tub of hot water in an adjoining bathroom. No drug is needed in this vapor, although it is generally customary to use tincture of benzoin in the amount of 1 dram to 1 quart of water. This adds a fragrance to the steam which is frequently pleasing to the patient. If tincture of benzoin is used, avoid the compound tincture in which the odor of aloes frequently becomes disagreeable. The vapor in the atmosphere helps in two ways: it prevents drying and crusting of the nasal secretions, and such moist air also frequently allays bronchial irritation and prevents coughing. The nasal passages may be kept moist by the use of any oily substance, the most common being white petrolagar. To this may be added 0.5 per cent *ephedrine sulphate;* or *epinephrine* in water may be used. Small amounts of these substances are best introduced into the nose by an applicator or medicine dropper. Spraying the nose and

[1] Herrick, James B.: The Treatment of Influenza, J.A.M.A., 73: 482, 1919.

throat with oily substances may also be advised. Too great an amount of oil introduced by any method may favor pneumonia of oil origin. Strong solutions of thymol or phenol are frequently irritating in action rather than soothing and serve no good purpose.

The problem of the patient's *diet* is generally not a troublesome one. In the acute stage of the illness there is no appetite and, later, any ordinary food is generally well tolerated. Do not order in hospitals at the onset of the disease a liquid diet and forget to increase it later.

The problem of *fluid intake* is handled differently in different communities. I know of one well-known group who advise as much as 200 gm. of orange juice every two hours. In the past, fruit juices have probably been over-emphasized. These are palatable to many who are acutely ill and are an excellent base for many drinks and aid in the introduction of a sufficient amount of water. The alkalizing power once stressed is not thought to be so important now. The fever and excessive perspiration tend to dehydrate the patient. He will, if not too ill, take the amount of fluid necessary for his comfort. If the patient in severe influenzal infections is extremely ill, stuporous, or delirious, it may be necessary to administer water in amounts sufficient to maintain the water balance of the body. The fluid intake must compensate for the amount lost by respiration, perspiration and urinary secretion. Coffee, tea, broth and milk frequently are pleasing additions and may be taken when water is distasteful.

The *bath* is an important item in the care of the patient. A tepid bath followed by an alcohol rub may be used to reduce the fever, if this is thought to be wise. Generally this is not advisable until the temperature rises to 104° F. or more. When there is excessive perspiration, frequent baths and changes of linen are important items of comfort.

The function of *drugs* in the treatment of these conditions is to control pain and reduce fever. Many drugs are used in one way or another, but one of the most valuable is *opium* and its derivatives. Formerly the use of Dover's powders was general. It relieves the discomfort and by its diaphoretric action reduces the temperature. It has been superseded, probably too generally, by the newer drugs and its benefits

forgotten. *Codeine* is used widely, particularly in treating patients with troublesome non-productive cough. Recently Diehl[1] reported the further use of the newer alkaloids of opium. This medical treatment of the cold consists in using small doses of codeine, papaverine and dilaudid in combination. Many modifications of this treatment have been advocated and seem to have some merit. The *dosage* is small, and the course of treatment consists of six capsules given over a period of twenty-four to forty-eight hours. The results are, of course, best when the patient has the usual bed rest.

Codeine is frequently the active ingredient of elaborate cough mixtures, and many times codeine alone would be more effective and would avoid the unpleasant effects of the unappetizing syrups with which it is combined. One of the least objectionable *cough mixtures* contains elixir terpene hydrate. Small doses of morphine or tincture of opium may be substituted where codeine is not tolerated, as may also be substituted *papaverine* and *dilaudid*.

The *salicylates* and allied drugs are probably most widely used in the treatment of respiratory infections. Acetyl salicylic acid, sodium salicylate, phenacetin and amidopyrine are all used for their antipyretic and analgesic effects. Both phenacetin and amidopyrine recently have become less popular because of their occasional unfortunate effect on the blood-forming organs. Their advantage lies in the more effective action from small dosages than can be obtained from the salicylates. When the salicylates are used, they should be accompanied by an alkalinizing agent, as sodium bicarbonate, or calcium carbonate. These alkalinizing agents destroy the irritating effect of the drug on the gastric mucosa. For adults generally a *dose* of 5 to 15 grains of salicylates is used every four hours. The amount and frequency of the drug administration depend upon its effectiveness in controlling pain and reducing the fever. *Alkalinizing agents,* particularly sodium bicarbonate and sodium citrate, are widely used for the effect of the alkali alone. Where the urine is particularly concentrated and highly acid, they may be of some value in relieving the condition but a similar result may be obtained by increas-

[1] Diehl, H. S.: Medical Treatment of the Common Cold. J.A.M.A., 100: 2042, 1933.

ing the fluid intake. The specific value of these drugs is not well demonstrated.

The reign of *quinine* in the treatment of colds has been a long one and is not yet at an end. Many of the advertised cold tablets contain varying amounts of some alkaloid of this drug. Its widespread use no doubt grew out of its undenied value in the chills and fever of malaria. After the introduction of quinine to the medical world, it was as extensively used as the sulfanilamide series of drugs are today, and possibly with as little critical thought. There is apparently no good reason for the continued use of quinine in the treatment of colds and allied infections.

Belladonna in the form of the alkaloid, atropine, is used to control excessive secretion of the nasal mucous membrane. This drug, too, is a part of many stock cold remedies. It has a certain value, but must be used with discretion. Many people are so susceptible to the effect of this drug that, with the administration of a normally small dose, they develop uncomfortable symptoms of mild atropine poisoning. Atropine should be given only when needed as a single dose and not incorporated with other drugs in a prescription to be taken at routine intervals. The unpleasant sensation of drying of the nose and throat frequently offsets the therapeutic or theoretical advantages.

Camphor, credited by some pharmacologists as having a mild stimulating effect, has been used for many years. Its use is empirical and possibly illogical, yet many men find it of value if given in doses of 1 grain or less three or four times a day.

Caffeine in small doses, either as hot coffee or tea or caffeine citrate in 1 grain doses, increases diaphoresis, stimulates the circulation, and increases the patient's comfort.

A *cathartic* used early in the course of the respiratory infection is frequently recommended. This to me hardly seems justified. With catharsis we have an increased loss of fluid, a certain amount of gastro-intestinal upset (which will be manifested in cramping and distention of the abdomen), and an increase in general physical activity. These disadvantages seem to outweigh the value—any cathartic might have. For

patients who are constipated, an enema on the second or third day of the illness is valuable.

When the respiratory infection is accompanied by pharyngitis or tonsillitis, *throat irrigations* are of much value in cleaning the throat of secretion and decreasing the pain. These generally should be used as hot as can be tolerated well. The heat is of more importance possibly than any medication. A weak solution of the National Pharmacopeial *liquor alkalinis antisepticus* or a solution of sodium bicarbonate or Dobell's solution diluted 1:10 may be used. Strong sclerosing drugs are contraindicatel as topical applications in the throat, and for this reason application of silver nitrate or phenol should rarely be used. These may injure the mucous membrane of the throat and, sealing over infected crypts, permit entry of pathogenic organisms into the blood stream. Many experienced physicians feel that secondary infections of severity are caused by this practice.

Early in the treatment of the disease I prefer to use some *hypnotic drug* to secure a good rest for the first few nights. Adequate rest through the night increases the well-being of the patient through the day. *Ice packs* to the neck may give comfort. At other times and with other patients heat is more desirable. An ice cap to the aching head is frequently comforting. Hot or cold compresses to the eyes may be used when there is an accompanying conjunctivitis. Shading of the light is also helpful in this instance.

Treatment of Ambulatory Patients.—Up to the present we have been considering the treatment of patients at bed rest. This is ideal so far as the patient is concerned, and it prevents further spread of the infection and almost completely eliminates the distressing and occasionally fatal complications. We should strive probably to treat our patients suffering from colds and influenza in this manner. Economic considerations and local custom, however, frequently prevent such a program, so a certain number must be treated as ambulatory patients.

Such ambulatory patients should be warned to protect those about them by not spreading the secretions from the nose and mouth; they should not handle food or personal articles to be used by others, and for their own safety should be as quiet

physically as is possible. A prescription favored by many, or some modification of it, for administration to these ambulatory patients is as follows:

Phenacetin	gr. 4
Amidopyrine	gr. 2
Pulverized camphor	gr. ½
Caffein citrate	gr. 1
or	
Aspirin	gr. 6
Camphor	gr. ½
Ext. belladonna	gr. 1/15
Caffeine	gr. 1

A dozen or fifteen of these capsules are given to the patient and he is advised to take four daily. While this prescription violates the rule of single drug medication and partakes of the nature of a shotgun dose, it is effective. Many physicians successfully use as ambulatory treatment a modification of the opium treatment mentioned above. Usually codeine and papaverine are used together and are given in the dosages and at the intervals suggested for patients at bed rest.

These measures discussed here at some length are subsidiaries to the chief therapeutic measure of rest; they are all means by which we hope to increase the patient's comfort while time and rest assist the body to overcome the infection.

Medical Clinics of North America
January, 1940. Chicago Number

CLINIC OF DR. RALPH C. BROWN

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SPASTIC IRRITABLE BOWEL

A POWERFUL weapon for the correction of abuses is ridicule, and such caricatures as those drawn by Axel Munthe in "The Story of San Michele"[1] have been curiously effective in casting opprobrium on the term "colitis" when used as a convenient mask to conceal ignorance of the precise nature of a patient's complaint.

Precision in terminology restricts the diagnosis of colitis to the various pathologic conditions in which there exists acute or chronic inflammation of the large bowel in greater or less degree. Such an inflammatory process may be merely a simple catarrh of the bowel, as evidenced by the presence of mucus in the feces—a condition, it should be noted, which very often is the end result of a purely *functional* disorder such as a chronic fermentative or putrefactive type of bowel dysfunction—or it may, of course, be any of the more serious forms of inflammation of the bowel wall causing ulceration and suppuration with blood and pus in the stool, as in the bacillary and amebic dysenteries, tuberculosis and nonspecific chronic ulcerative colitis. But the term "colitis" should not be carelessly and loosely used, as it so often is, when no structural change in the bowel wall exists and when the clinical picture is based upon one of the several types of purely functional disorder of the colon.

Spasticity of the large bowel is by far the most common cause of abdominal discomfort and pain, and an understanding of its mechanism and of its origins is a prerequisite to accuracy in the diagnosis of abdominal complaints. Spasticity—increased muscle tonus—directs one's thought to the nerve

[1] E. P. Dutton and Co., New York, 1929.

supply of the colon, and there one finds an intrinsic, automatically functioning nerve mechanism formed by the plexuses of Auerbach and Meissner, as well as an extrinsic nerve supply through the vagus and splanchnics, through which impulses from the central nervous system influence the several functions of the bowel, often to a remarkable degree. A young man of my acquaintance had given up dining out because of the violent, uncontrollable urge to defecation which would invariably occur when he found himself seated as a guest at a formal dinner party. Under no other circumstances would this embarrassment occur. He has an unstable vegetative nervous system as an inheritance and is grateful for the sense of social security afforded by a small amount of tincture of opium taken just before going to a dinner.

Irritation or abnormal stimulation of the delicate nerve mechanism which governs the tonus, peristaltic action and mucus secretion of the colon causes a wide variety of clinical pictures which are all too frequently erroneously diagnosed as "colitis." The purpose of this clinic therefore is to attempt to make clear the principle that, when confronted with any one of the various types of bowel dysfunction, the clinician must search for some *irritant* which is acting upon the above-described nerve mechanism. We shall not deal in detail with transitory, acute disturbances due to dietary indiscretions and ptomaines, but rather with the more chronic clinical pictures due to an irritable, spastic bowel.

There are three groups of irritants, the effect of which, operative over a period of time, is the setting up of spasticity of the colon:

1. The long-continued use of *cathartics* and copious irritating *enemas.*

2. *Chemical irritants,* formed by fermentative and putrefactive processes within the colon.

3. *Hyper-irritability of the vegetative nervous system,* on the basis of either a constitutional "minderwertigkeit" or an acquired hyper-irritability resulting from nervous stress and strain or chronic fatigue of the nervous system.

Spastic Irritable Bowel Resulting From Cathartics and Enemas.—With respect to the cathartic group of cases, it should be noted that many individuals can undoubtedly take

mild cathartics for years without experiencing any ill effects, but in a far greater proportion of cases the long-continued use of physics and of copious enemas sets up an irritability of the bowel wall of one of two types: either a true catarrhal inflammation of the mucous membrane, or in the case of the aromatic cathartics, an irritability of the nerve elements in the bowel wall. Both conditions result in varying degrees of hypertonus or of definite spasm in the muscle wall of the colon, with correspondingly varying degrees of discomfort or actual pain in the abdomen. When a segment of gut is cramped down in a state of chronic spasm, the sensory effect is the same as that caused by marked over-distention of a normal loop of bowel; hence the sensation of fulness, pressure and distention of which these patients complain at a time when physical examination fails to reveal any appreciable degree of tympany.

The patient, knowing nothing whatever about spasticity of the large bowel but knowing very well that he is uncomfortable and convinced that he is full of gas, takes one or more enemas, possibly a more powerful cathartic, and decides to eliminate some suspected article of food from his diet to relieve what he believes to be gas formation. Over a period of time resort is had to various types of physics, the diet is tinkered with, and first this item is thought to disagree and then another article of food is cut out of the diet, with the result that weight and strength are lost. Someone is likely to suggest a course of colonic flushings, and to the patient's dismay he discovers that the abdominal pain and distention are aggravated by such treatment. All too frequently at this stage the appendix comes under suspicion, and is removed or an exploration of the abdomen is done. Individuals who have pursued such a course and have undergone one or more surgical operations without relief of their abdominal distress frequently are found to be in a deplorable state of physical and mental health.

In general, the history discloses that these patients with supposed cases of constipation, taking cathartics and enemas daily, actually rarely if ever pass a formed stool; the feces are mushy or watery or, if formed, small in caliber, finger thick, flat or ribbon-like—characteristic evidence (barring organic rectal disease) of spastic contraction of the colon. These individuals commonly have from two to four loose or

small caliber stools a day, week in and week out, but in spite of this fact they almost invariably attribute their symptoms to a lack of sufficient elimination. Nor does the pernicious teaching to the effect that normal health requires three or four bowel movements daily aid their psychology.

It should now be more generally recognized that a spastic condition of the colon is far more often the basis of constipation than is the atonic, so-called "sluggish" bowel. Eliminating the readily recognizable cases in which constipation is due to *organic disease* of the bowel wall, as in carcinoma, stricture, and inflammatory tumors based upon diverticulitis, as well as the occasional case in which marked weakness of the pelvic floor and the abdominal wall plays a rôle in causing constipation, it is possible to say that there are very few cases indeed in which the muscles of the wall of the colon are incapable of propelling the fecal content onward in a normal manner, provided it is supplied with the adequate mechanical and chemical stimulus of an appropriate diet. In other words, at least 95 per cent of patients complaining of habitual constipation are capable of enjoying normal bowel function, and such a normal state can be established by simple measures within a very short time in a vast majority of cases—much to the satisfaction and comfort of the type of patient under discussion.

Fermentative Type of Spastic Irritable Bowel.—The fermentative type of irritable spastic bowel requires special emphasis. The bowel disturbance results directly from the irritating effect on the bowel wall of certain acids and gases liberated in the colon by an abnormally active fermentation process there. This is made possible by a failure of proper digestion and absorption of starches and sugars in the small intestine. When carbohydrates pass on into the cecum, the local conditions, *i. e.*, bodily heat, moisture, and a fermenting type of bacterial flora, are ideally favorable for the setting up of such a fermentative process. The lactic and acetic acids and carbonic acid gas liberated act as lively irritants to the mucous membrane of the colon, often having the effect of mild cathartics. Over a period of time the long-continued influence of such irritants sets up an irritability of the bowel wall just as the long-continued use of cathartics may so do, the end effect being an irritable, overresponsive, spastic bowel,

often associated with an appreciable degree of catarrh of the mucous membrane.

What are the earmarks of this fermentative type of bowel dysfunction and how is it to be recognized? The subjective complaints of the patient will be much the same as in the cathartic user, *i. e., flatulence, bloating* and *general abdominal distress* of the fulness and pressure type. However, these fermentative cases actually pass *great quantities of gas by rectum,* and a rather characteristic earmark of this condition is the *intermittent occurrence of the symptoms:* several days of abdominal distress and general malaise associated usually with the explosive passage of several loose stools daily, alternating with periods of several days of comparatively normal bowel function and greater comfort. Vertigo is a common symptom. I recall a patient who came to me from New Orleans where, because of a vertigo sufficiently severe to cause him to hesitate to cross the street alone, the diagnosis of cerebral syphilis had been made. A very marked degree of fermentative colitis (much mucus in the stool) proved to be his only disorder, and the vertigo promptly and completely cleared up within a few days after placing him on a diet low in carbohydrates.

The *diagnosis* of the underlying cause of this form of irritable colon is made by examining the bowel movement. The gross appearance is very characteristic: a pultaceous, unformed mass of feces, usually light yellow in color, so honeycombed with gas bubbles as to cause a light and spongy consistency of the feces. More or less mucus may be present. Testing with a strip of blue litmus shows the stool to be strongly acid in reaction, and upon mixing up a bit of stool on a slide with Lugol's solution and examining it under low power, innumerable masses of starches in various stages of dextrinization may be seen. Another characteristic finding is the large number of coarse granulose-containing organisms, Clostridium butyricum, in the fecal smear.

An *abnormally large amount of undigested starch* and the *strongly acid reaction of the stool* therefore makes the diagnosis of a fermentative type of bowel disorder. The failure of adequate starch digestion and absorption in the small intestine may be due to insufficient amylolytic action, but far more often it is the result either of a dietary error, namely, too rich a

carbohydrate diet and poor mastication, or of a hyperperistalsis in the small bowel which hastens the passage of sugars and starches through the small intestine before digestion and absorption have been completed. This is a form of intestinal dyspepsia very commonly overlooked in medical diagnoses. There still exists a rather general reluctance to devote time and skill to the intelligent examination of a patient's feces.

Chemical irritation of the bowel due to a chronic putrefactive process in the colon.—This is far less frequent than pathologic degrees of fermentation. It is caused by a preponderantly *protein diet* and the influence of such a diet on the bacterial flora of the colon, *i. e.*, an overgrowth of gram-negative bacteria. Clinically this may be observed in individuals who eat chiefly meat; and also in cases where a very low carbohydrate diet has been ordered as a therapeutic measure, as advocated in the treatment of chronic arthritis for instance. *Feces are strongly alkaline* to litmus and have an *ammoniacal odor. Foulness of breath* is characteristic. A normal status is readily restored by a balanced diet and the liberal use of lactose.

Hyperirritability of Vegetative Nervous System.—In this third group of cases the irritable state of the neuromuscular mechanism of the bowel wall is not dependent primarily upon the effect of chemical irritants, as in the cathartic and fermentative types, but on an excessive degree of sensitivity in the nerve elements within the bowel wall, the plexuses of Auerbach and Meissner, and of the vegetative nervous system in general. These patients are over-responsive to nerve impressions. Quoting Lord Dawson, "They have a barometric abdomen. Fatigue, fear, anxiety, mental stress and strain manifest themselves in their hollow viscera."

Two types of cases are seen with great frequency: In one type the basic factor is a *constitutional below-parness of the vegetative nervous system.* The patient is apt to be of the Stiller type, under-nourished, with weak, flabby muscles, narrow epigastric angle, low-lying abdominal viscera, cold and clammy hands and feet, and an abnormally low blood pressure. Examination of the abdomen reveals a contracted, rope-like, tender transverse and descending colon. The stools, when uninfluenced by cathartics, will characteristically be

small in caliber or ribbon-like; or they may be hard, dry, ball-like stools of the sheep-dung type. These patients complain of the widest possible variety of abdominal distresses, varying from simple fullness and pressure discomfort to abdominal pain of severe degree. Any stress or strain, emotional disturbance, or marked loss of sleep will aggravate the symptoms and, in women, the symptoms are almost invariably more troublesome during the menstrual period.

The other form, of the *purely nervous type of irritable bowel*, is seen in individuals who, under normal conditions of life, are comfortable and commonly enjoy a normal bowel function and good general health. But adverse conditions arise: A bull stock market, for example, with easily acquired wealth and the stress upon the nervous system incident to getting by day and spending by night. Or the converse: Economic depression and the dire necessity for straining every faculty, every nerve, to maintain existence. This entails long hours of intensive work; inadequate sleep; no recreation; no repose. With what result in the susceptible individual? There is a gradually increasing sense of consciousness of the abdomen, a sense of fulness and pressure after eating a few mouthfuls of food, a feeling that everything ingested turns into "gas," then constipation, cathartics, tinkering with the diet, often with a developing fear of cancer.

Actually this is nothing more than a spastic colon, a colon with disturbed tonus and rhythm. How often, however, in these circumstances has an innocent appendix been sacrificed when a complete cure of the subjective complaints could have been brought about by sending the patient on a two weeks' fishing trip?

Justification for a more detailed clinical study of patients having symptoms suggestive of irritable, spastic bowel is the increasingly general appreciation of the fact that, apart from menstrual pains, spasticity of the bowel is probably the most frequent cause of abdominal pain and distress. It is my conviction that failure to recognize functional bowel disorders constitutes the *single greatest source of error in abdominal diagnosis*. Reference need only be made to the much-abused diagnosis of chronic appendicitis. A viewpoint now very generally held is thus authoritatively stated by F. Ehrlich in the

Archiv für Verdaungskrankheiten, "It is a well-known fact that 30 to 40 per cent of patients operated upon for 'chronic appendicitis' retain their symptoms after operation, often to an increased degree." At least one out of four cases of markedly irritable colon observed at the Presbyterian Hospital will have had an appendectomy at some prior time.

TREATMENT

The indications for treatment of spasticity of the large bowel necessarily are governed by the underlying causative factors:

Cathartic Type.—When based upon the *long-continued irritating effect of cathartics,* the therapy is directed toward securing and maintaining normal bowel function. To this end all forms of laxatives and copious enemas are stopped forthwith and the patient is instructed as to diet. If the bowel is very irritable, a brief period of bed rest, with continuous hot moist packs over the entire abdomen, maximum doses of belladonna, and a very bland diet, may be required, especially if catarrh of the bowel forms a part of the picture. With less marked degrees of spasticity all that is necessary is to cut out all physics, order a diet containing a liberal content of bland residue, including oatmeal, rye and graham bread, potatoes, liberal amounts of cooked vegetables with both noon and evening meals and cooked fruits, but with temporary avoidance of all raw fruits, raw vegetables, ices, ice-cold drinks, gingerale, fruit juices, beer and buttermilk. At the same time instructions are given as to the use of small sweet-oil retention enemas at bedtime when there has been no bowel evacuation during the day.

These measures, with the use of belladonna and possibly moderate doses of bromides, suffice to bring about a normal sequence of movement of fecal material through the colon. However, the patient must be taught the simple physiology of the colon and rectum, and must be given an understanding of the fact that the *consistency* of the stool is the index as to the length of its period of residence in the colon. If a stool of butter-like consistency is passed, no matter how small the material evacuated may be in *quantity,* he need have no anxiety regarding the state of the bowel function. Actual constipation

is evidenced by hard and dry stools. Fecal material retained longer than normal will be made hard and dry by the constant absorption of water from the fecal mass by the bowel wall. Constipation associated with marked spasticity of the bowel will be definitely aggravated by the use of very coarse diets, bran, and other similar supposedly laxative articles, as well as by the chemical effect of oranges, beer and buttermilk. Such an over-responsive colon must be shielded from mechanical, chemical and thermal irritants if a normal tone and rhythm are to be restored.

Fermentative Types.—The fermentative cases clear up readily on a *diet excluding*, insofar as possible, all *carbohydrates*. The initial diet should consist of a liberal content of simply-prepared meats, clear soups, eggs, vegetables of the 3 to 5 per cent carbohydrate group in puree form, a very small portion of thoroughly toasted bread with a maximum amount of butter, and gelatin preparations. Milk is excluded, but half a glass of cream diluted with one-half glass of tea, Vichy, or plain water is taken with each meal. Fruits cooked without sugar and sweetened with saccharine and the simpler forms of cheese are included.

Within a very few days fermentation in the bowel ceases, the stools resume normal form, and the symptoms of distress disappear. After two weeks, certain of the more readily digestible carbohydrates may ordinarily be added, such as cream of wheat and rice. Strained honey may be substituted for saccharine and sugar and salad vegetables may be added as the bowel irritability subsides. Potatoes are offenders in this condition and, when finally added to the diet, should be in baked form only. Few digestive disorders yield so readily and completely to simple treatment as this form of dysfunction of the bowel.

Constitutionally Below-Par Individuals.—More difficult in respect to treatment are the constitutionally below-par individuals with spastic bowel. Often the status of these patients is that of the chronic dyspeptic invalid with a long history of having undergone various forms of medical and surgical treatment. Usually they are undernourished, introspective and skeptical of the likelihood of ever regaining a measurable degree of comfort and health.

These patients require hospital care and the exercise of much good judgment as well as skill upon the part of the physician. Treatment must be directed primarily to the individual as a whole rather than to the bowel disorder which may be the immediate cause of the outstanding complaints. The wise use of various sedatives to soothe the hyperirritable nervous system and to insure adequate hours of sleep, the building up of the state of nutrition and of the blood, and instilling into the despairing heart of the patient assurance and hope for recovery, are essential factors. Hot, moist blanket packs about the abdomen, similar to pyelitis packs, are most useful in relieving bowel spasm and pain. The initial diet should be very bland and can be increased only from personal knowledge of the day-to-day improvement in the abdominal discomfort and the character of the stools.

In the way of *medicaments,* the two most useful preparations are tincture of belladonna and tincture of opium. To be effective in relieving bowel spasm and restoring normal intestinal tonus and rhythm, belladonna must be used in doses approximating the physiologic limit, which will vary greatly in different individuals. Opium is invaluable when used wisely. It is remarkable how profound is the influence upon an irritable bowel of even such minimum doses as 3 or 4 drops of the tincture of opium given four times daily.

Patience and *time* are essentials in the treatment of the victims of constitutional asthenia suffering from a spastic colon. They cannot be restored to a measurable degree of comfort and health in a day or in a week. The problem is not simple as in the cathartic and fermentative groups of cases. However, these patients need not be condemned to a life of chronic semi-invalidism, bearing the tag of weak-spirited, introspective dyspeptics. They are deserving of a better fate. Made comfortable by appropriate management, physically strengthened by a restored state of nutrition, with normal bowel function re-established and ability to eat and sleep in comfort, there arises in these individuals a zest and capacity for life hitherto unknown to them.

Finally, these patients must be informed as to how to live in this difficult world. How to work and how to play. In particular they must be taught how to rest. They must be

made to understand that they are not for the rough and tumble of life, that the inherent characteristics of their nervous systems impose certain limitations upon their capacity to stand the stress and strain of existence, and that if they would enjoy freedom from all of the varied distresses that arise from an irritable bowel, they must live wisely, setting the tempo of life at a slow and quiet pace.

Medical Clinics of North America
January, 1940. Chicago Number

CLINIC OF DR. LEE C. GATEWOOD

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THE DIFFERENTIAL DIAGNOSIS OF LIVER ENLARGEMENTS

Determination of the Origin of a Mass.—The group of cases of liver enlargement presents one of the common problems in the diagnosis of abdominal diseases and one which is at times baffling. It is first necessary to identify the mass in question as taking origin from the liver, and this is as a rule easily done by demonstrating a broad anterior surface extending under the right costal margin and presenting a continuous surface across the epigastric region to disappear under the left costal margin. In some cases, however, the surface of the mass is so irregular that it becomes exceedingly difficult to know whether the mass being palpated is continuous with the liver or is an irregular or nodular mass closely adherent to the lower margin of the liver.

Under such circumstances it may prove helpful to try to gently fix the nodular mass in the expiratory position and see whether the liver moves upward in expiration, allowing the mass in question to separate from it. Manifestly this procedure will prove of value only when one can grasp the mass in question and when it is not too firmly attached to the liver. It is necessary in all such manipulations to avoid undue roughness. I remember an autopsy some years ago disclosing a liver riddled with carcinoma metastases which had been ruptured by the palpations of an examining room interne and death had occurred from hemorrhage.

The masses which most frequently simulate liver enlargement are those relatively flat or plaque-like masses produced by carcinoma of the stomach or colon, nodular thickened plaque-like carcinomatous omentum, and occasionally tubercu-

lous omental masses. These can frequently be differentiated from liver masses by palpation under the fluoroscope after putting a little barium contrast medium into the stomach or colon to demonstrate that there is an alimentary tract lumen within the confines of the mass. This serves again to emphasize the point that such examinations should be made by the internist and not relegated to a roentgenologist who cannot have so clearly in mind the physical findings nor the associated data and who, all too frequently, makes his examination with leaded rubber gloves so thick that no efficient palpation is possible.

Palpation.—Having determined the presence of a palpable mass in the liver region, the next step should be the detailed exploration of all of the available surface and margin of that mass. It may seem a bit trite to say that the palpation should be carefully done in such way as to determine the *size, shape* and *contour,* and *consistency* of the mass, its *mobility* and *respiratory excursion,* and the presence or absence of *tenderness.*

All too often the student or interne is satisfied when he has discovered merely that a mass is present. When conditions are favorable for palpation, and thorough examination is not prevented by mechanical difficulties or by tenderness, one should not regard his palpation of such a mass as having been completed until he feels that he is able to go into the laboratory with modeling equipment and produce a model which will duplicate, in everything except color, all of the accessible portions of the original tumor—a mass which, inserted in the abdomen of a cadaver, would duplicate the findings in the patient. The examiner should then be able to draw a detailed diagram of the mass in question and to indicate its presumed relations to other adjacent structures.

When palpation is done in this manner, it will go far toward reaching a conclusion concerning the nature of the pathology. It is true that much of the surface of the liver lies behind the bony cage of the ribs, where it is not accessible to palpation. However, the outline of its upper margin may often be clearly seen in a chest film where it is covered only by a thin layer of diaphragm. In appropriate cases the introduction of air into the peritoneal cavity to separate the liver from the diaphragm

or the lateral walls of the cavity, will show on fluoroscopy or in the roentgenogram a clear outline, or may show, through the failure of the air to penetrate this space, the existence of infiltrations or inflammatory adhesions. The roentgen visualization of the liver itself by means of thorotrast or similar substances is as yet experimental, and evidence thus far seems to indicate dangers which would preclude its use except in certain very limited conditions.

CLASSIFICATION OF LIVER ENLARGEMENTS

Liver enlargements may be classified for purposes of diagnosis into those which are *regular* or *uniform*, and those which are *irregular*. It is to be recognized that a regular or uniform enlargement will in general tend to result from any process which affects the entire liver simultaneously.

Uniform Liver Enlargements.—*I. Passive Congestion or Back Pressure on Venous Flow.*—This most frequently occurs in the passive congestion of heart decompensation. More rarely the mechanism may be due to mediastinal masses compressing and obstructing the vena cava or to stenoses or other mechanical obstructions of hepatic veins.

II. Obstruction to Bile Duct Outflow from the Liver when of Severe Grade or Persistent.—The degree of enlargement depends upon the severity and persistence of the process. Included in this category are common duct obstructions due to gallstones, to pancreatitis or carcinoma of the head of the pancreas, or to carcinoma of the biliary ducts or ampulla of Vater, and occasionally to various benign or malignant enlargements along the course of the common or hepatic duct and making pressure upon it. Manifestly this entire group of liver enlargements will be characterized by severe and persistent *jaundice* with laboratory findings characteristic of the obstructive type of jaundice.

III. Conditions Producing Diffuse or Generalized Liver Parenchymal Changes.—These consist in hepatitis or cloudy swelling, amyloid disease fatty changes, and the infiltrations of leukemia and of Hodgkin's disease. Important etiologic factors in this group are the exogenous liver poisons, such as arsenic, the benzol and toluol chemical group, chloroform, and phosphorus. In many cases this type of enlargement will be

associated with varying degrees of jaundice and, in general, the laboratory reactions in such jaundice are those of the hepatosis or mixed type. In many of these conditions the etiologic factor (*e.g.*, pneumonia, arsenical poisoning, etc.) will produce associated findings in other parts of the body such as to render the diagnosis manifest and perhaps to make the management of the liver pathology merely an incident in the general therapeutic program.

Nodular or Irregular Liver Enlargements.—In general these are due to:

I. Processes which give rise to localized cellular proliferations, causing formation of tissue in localized foci or going on at irregular rates in different parts of the same pathologic process. Most common of this group are the *neoplasms,* the usual one being *metastatic carcinoma.* Most frequently this is secondary to carcinoma of the stomach or some other part of the gastro-intestinal tract and reaches the liver by extension along the portal tract. The result is a liver riddled with tumor tissue in many nodules of varying ages and sizes and frequently growing at different rates in different parts of the same tumor nodule.

In this manner is produced a liver surface which is markedly irregular with no uniformity in the size, shape, or distribution of the projecting prominences. Where *nodules* develop near the liver margin, *they enlarge to form the margin,* producing a liver edge which is *hard* and *irregularly rounded* to the thickness of a man's hand. When the process is extensive, the liver tissue between and about the tumor nodules as a rule becomes increased in density, so that the entire liver feels hard and irregular.

This is in strange contrast to *primary carcinoma* of the liver, which is of much rarer occurrence (probably about 1:25 according to the autopsy statistics of the Cook County Hospital). In primary carcinoma of the liver there is a tendency for the tumor to infiltrate and extend within the liver, but without extending above the normal smooth contour of the organ. In this way there may result a *more uniform liver enlargement,* with only slight to moderate irregularity in general contour and none of the nodular irregularity so characteristic of metastatic carcinoma of the liver. A similar tendency is frequently noted

in sarcomas of the liver, notably in melanotic sarcoma secondary to sarcoma of the eye or originating in pigmented moles. This is probably due to the hematogenous mode of distribution of the tumor cells into the liver parenchyma.

The type of enlargement produced by metastatic carcinoma is most nearly duplicated by the irregular distribution of the proliferative process in the regeneration of liver tissue from

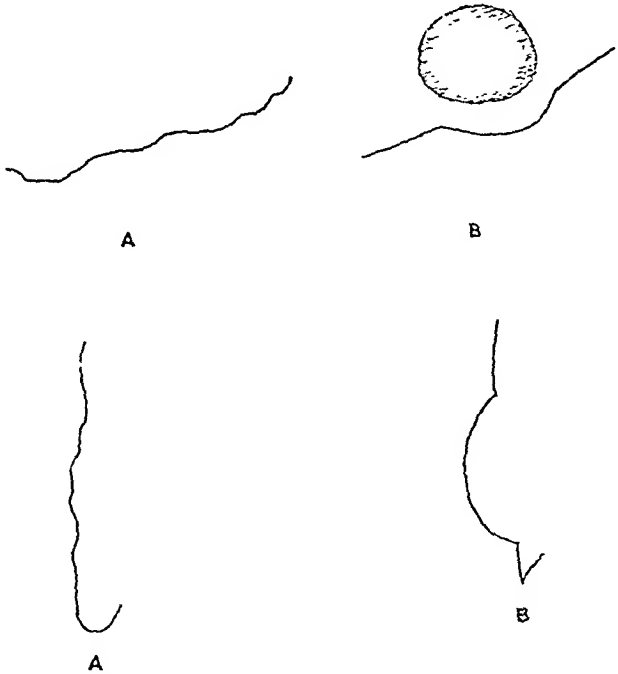

Fig. 31.—Diagram of the anterior surface and sagittal section of liver edge, contrasting the contour of carcinoma metastases with that of gummata of the liver. *A*, Carcinoma. *B*, Gumma.

duct remnants in *portal cirrhosis*. The surface and contour of liver thus produced is, in many instances, not distinguishable on palpation from the carcinomatous liver. Since both conditions may be associated with ascites, and in the latter stages also with jaundice, the differentiation must rest upon other evidence. A careful search for occult blood in the feces, roentgenologic evidence of a primary tumor of the gastro-intestinal tract, and a careful examination of ascitic fluid, if present, may

prove quite significant. This fluid in cirrhosis is characteristically transudative in character with low specific gravity, albumin and cellular content. In carcinoma this may also be true, but it frequently occurs that the specific gravity is increased and the fluid is found high in protein and cells. Occasionally tumor cells can be identified in the centrifuged sediment of the ascitic fluid.

Gummata of the liver are less frequently encountered now than a few years ago. They present, as a rule, in the active untreated stage, a contour characterized by rounded, smooth, moderately firm elevations above the surface of the liver comparable to that which would be palpated if half of a rubber ball had been affixed to the surface of the liver. The intervening uninvolved liver tissue is only slightly firmer than normal. As the gummata enlarge, they push back the surrounding tissue. In this way the development of a gumma near the margin of the liver does not cause the edge of the liver to become involved in the nodule. The gummatous area *does not become the margin,* as does a carcinoma nodule, but pushes the margin ahead so that, in thin-walled patients, the liver edge may be palpated as slightly deflected around the nodule, but sharp and thin in contrast with the thickened, hardened, rounded liver margin of carcinoma (Fig. 31). This picture may be modified by degeneration of the gummata with subsequent cicatrization producing further irregularity due to the contraction of fibrous connective tissue.

II. The presence of irregularly distributed fibrous connective tissue, whether as a result of cicatrization of gummata or of abscesses, hydatid cysts, or other inflammatory processes, when followed at a later date by a process which would normally produce a smooth regular liver enlargement, may give rise to irregular enlargement. In that event the unrestricted areas may bulge with intervening depressions, grooves or fissures analogous to those produced when a sack of loose wool is tightly tied by ropes wrapped around it in various directions.

III. Among the rare causes of irregular liver enlargement are to be considered such localized inflammatory processes as *amebic abscess,* and, less commonly, abscesses due to the various *pyogenic micro-organisms.*

Amebic abscess is very often single and may cause enlarge-

ment of the liver without recognizable distortion in its shape. In one such instance autopsy upon the body of a patient with a known heart lesion disclosed an abscess containing nearly a gallon of pus within a liver which had been regarded as enlarged by passive congestion of heart decompensation. Frequently, however, multiple small abscesses may produce localized regions of irregular enlargement.

Hydatid cysts of the liver likewise may produce single or multiple areas of enlargement, and the resulting liver contour may be grossly irregular or so slightly modified in outline as to be indeterminate.

Congenital cystic disease of the liver is of rare occurrence and is usually found only in patients presenting also cystic disease of the kidneys.

In this entire group of enlargements due to collections of fluid within cysts or abscess cavities, the fluid tension may be such as to allow of a sense of fluctuation on palpation, but far more commonly the degree of tension is such as to give the impression of a solid mass. Any of the group of localized proliferative enlargements, abscesses, or cysts may produce pressure upon the bile ducts within the liver, producing jaundice. Under such conditions it usually happens that outflow from certain segments of the liver is obstructed while that from other parts of the liver is free and unimpeded.

The findings will, therefore, include an increase in blood icterus index with a van den Bergh reaction of the obstructive type, the presence of bile in the stools, and in many instances sufficient normally functioning unobstructed liver parenchyma to produce a normal cholecystogram.

ILLUSTRATIVE CASES

Case I.—V. M., Italian, aged forty-two, male, a tailor. Entered the hospital acutely ill with fever (102° F.) and a history of epigastric pain and tenderness for one week. Previous to that time he reported himself as always well except for pneumonia at age ten. There had been no nausea or vomiting, no attacks of severe abdominal pain, and no history of any attacks of jaundice. His bowels had usually moved twice daily and the consistency varied from hard to loose. He had had a tendency to constipation for the past few days. There

was no history of prolonged periods of diarrhea nor of blood or pus in the stools. There was no history of venereal disease. The patient had customarily used one or two small glasses of wine daily, but no whiskey or beer. The history was in other respects essentially negative.

Physical examination revealed a well-developed, well-nourished, moderately pale man whose outstanding findings were limited to the abdomen. The entire upper portion of the abdomen was occupied by a mass, which was readily identifiable as an enlarged liver, extending in the midclavicular line a hand's breadth below the costal margin. The lower border, from its most lateral extent to the midclavicular line, followed a direction parallel to the normal liver border, and the surface of the liver in this region was smooth and only moderately increased in firmness. The edge of the liver in this portion was sharp and moderately firm. From the midclavicular line the lower border of the liver dipped somewhat, crossing the midline just above the umbilicus and curving thence upward to the left costal margin, midway between the parasternal line and the left mammillary line. That portion of the liver's anterior surface lying to the left of the right midclavicular line was hard, grossly nodular, with irregular elevations varying in size from 2 to 4 cm. in diameter and elevated from 0.5 to 1.5 cm. above the surrounding surface. This portion of the liver was moderately tender. The elevated areas were definitely irregular, harder than the right lobe of the liver, and presented no evidence of fluctuation or elasticity.

The problem presented, therefore, was that of the differential diagnosis of irregular liver enlargements. The temperature upon admission showed daily variation from 99° to 102° F. Laboratory findings included blood Wassermann negative, hemoglobin 73 per cent, red blood corpuscles 4,200,000 and leukocytes 16,800. A differential count revealed: polymorphonuclears 72 per cent, lymphocytes 22 per cent, eosinophils 4 per cent, unclassified 1 per cent. Echinococcus complement-fixation reaction was reported as weakly positive, showing 25 per cent inhibition of hemolysis. Urine examinations were negative except for a trace of albumin and an occasional hyaline cast. Gastric analysis showed free HCl 20, total acid 42. The first five stool specimens obtained were negative for

occult blood, but following this a number of liquid stools were obtained, all of which were positive. Repeated examinations of feces were negative for parasites of all kinds, including ameba. Cultures of feces for Endameba histolytica were not then available. Colon fluoroscopy with a barium enema showed moderate spasm of the descending colon, but no filling defects and no abnormality of haustration or smoothing of outline indicative of an ulcerative process in the colon. Chest fluoroscopy was negative except that the right side of the diaphragm was slightly elevated and showed less respiratory motion than usual. Stomach fluoroscopy was negative. Cholecystography, following the oral administration of dye, failed to visualize the gallbladder.

Such localized nodular enlargement of the liver is compatible with the presence of carcinoma metastases, hydatid cyst or other cystic disease of the liver, multiple abscesses, or gummata which have lost their smooth globular contour by reason of degeneration or partial resorption. Syphilis was apparently excluded by the negative Wassermann reaction and the absence of any suggestive history, and metastasis seemed improbable in the absence of evidence of tumor in any of the more common primary sites in the abdomen. Liver abscess and hydatid cyst seemed, therefore, to be the lesions most nearly compatible with the findings. Echinococcus infection is usually acquired from dogs, the mode of transmission being by feeding the dog at the family table or allowing the dog to lick the hand or otherwise contaminate it with his saliva, which contains the infecting organism. This is then transferred to the gastrointestinal tract of the patient by his eating without meanwhile having washed his hands. A careful search for such history was entirely negative. The weakly positive complement-fixation test and low grade eosinophilia were suggestive but far from conclusive. Irregular fever may occur in cases of hydatid cyst which have become secondarily infected, but is a more regular part of the picture of liver abscess.

In spite of the negative stool examinations, therefore, a therapeutic test was made with emetine, 1 grain being given intramuscularly each night for ten days. After three days the temperature no longer exceeded 99° F., and two weeks after starting treatment the patient was discharged, feeling quite

well. The findings upon physical examination, however, had not changed materially. The liver subsequently gradually decreased in size, but there has been some persistent irregularity in its surface. The patient has been reexamined from time to time and there has been no recurrence of symptoms.

Case II.—Paul P., Greek, aged thirty-eight, male, a commission merchant, entered the Presbyterian Hospital acutely ill. He gave a history of sudden onset of fever and chills, malaise and upper abdominal pain or discomfort following exposure to cold eight weeks prior to admission. Jaundice appeared forty-eight hours later and had persisted to the present time, though varying somewhat in degree. His stools were never clay-colored but were yellow. His family physician, who examined him at that time, reported the liver moderately enlarged, and since that time it had gradually but progressively increased in size. Fever ranged from 100 to 103° F. and chills had occurred at irregular intervals. The patient had lost 20 pounds in weight since the onset of the illness. His previous history was essentially negative.

Physical examination of the head, neck, thorax and extremities was negative except for evidence of icterus. The upper part of the abdomen bulged asymmetrically. The lower border of the liver was at the level of the umbilicus and the right lobe was enlarged more than the left. The surface was irregular in contour and in consistency, harder than normal. Definite elevations and grooves were palpable. There was no friction or crepitation.

Laboratory findings included blood Wassermann reaction negative, hemoglobin 52 per cent, red blood corpuscles 3,350,000, and leukocytes 6950. A differential count showed: polymorphonuclears 60 per cent, lymphocytes 34 per cent, eosinophils 1 per cent, basophils 1 per cent, transitional cells 5 per cent. Bleeding time was six minutes, coagulation time three minutes. The blood icterus index was 49.2. Stools varied from yellow to brown and were positive for bile, but negative for occult blood, ova and parasites, including amebae.

A therapeutic test with emetine had been carried out by the family physician before the patient entered the hospital, with no result. Repeated complement-fixation tests for echinococci

were made with all of the antigens available. The results included a complete negative with one antigen, a positive reported as 50 per cent with another, while a third showed ++++ at dilution 1:40, ++ at 1:60 and negative at 1:100. Questioned concerning the characteristic association with dogs, the patient acknowledged such occurrence in his youth in a part of Europe where echinococcus infestation is known to be common.

On the basis of these findings a diagnosis of hydatid cyst of the liver was made and laparotomy was advised. At operation an echinococcus cyst of the liver was found from which was evacuated 4400 cc. of secondarily infected fluid containing great numbers of small cysts. The patient made an uneventful recovery and was discharged seventeen days after operation.

Case III.—Mary L., a colored female aged seventy plus, entered the Cook County Hospital because of vague abdominal discomfort of indefinite onset and probably of about three months' duration. There had been no severe pain at any time. Jaundice gradually appeared about three weeks previously and had been persistent. The patient had not observed the stools.

Physical examination revealed, in addition to the findings of a moderately severe icterus, a marked enlargement of the liver. The abdominal wall was thin and palpation was, therefore, very satisfactory. The liver lower border was irregularly scalloped, and the entire accessible surface presented rounded, relatively smooth, globular prominences. Some of these seemed quite firm in consistency, but two or three of the larger elevations presented a sense of elasticity, suggesting fluid content. No other masses were palpable in the abdomen. There was no ascites. The temperature was normal throughout the period of observation.

Laboratory findings included blood Wassermann test negative, moderate secondary anemia, icterus index gradually increasing, with obstructive type van den Bergh reaction. Stools were negative for blood, ova and parasites but positive for bile. Urine examinations were negative. Cholecystography was not attempted because of the degree of jaundice. Fluoroscopy of the stomach and colon was negative.

Because the history and findings were regarded as not

readily explainable on the basis of any of the commoner causes of jaundice and irregular liver enlargement, an exploratory laparotomy was advised but was refused by the patient. Jaundice steadily increased and her condition became gradually worse, and she died after having been on the ward for about three weeks. Autopsy revealed cystic disease of the liver with large cysts compressing and obstructing the right and left hepatic ducts and coincident congenitally cystic kidneys of moderate size.

Case IV.—Elizabeth J., a colored female aged thirty-seven, entered the Cook County Hospital because of general malaise, loss in weight, and vague upper abdominal discomfort. Previous history included marriage at age sixteen, with repeated miscarriages in the subsequent years and one brief period of "treatment for her blood."

Physical examination revealed the lower margin of the liver 7 cm. below the costal margin. For the most part it was straight, moderately firm and sharp-edged. In the epigastrium there were three distinctly palpable, smooth, rounded elevations on the anterior surface of the liver, firmer than the surrounding hepatic tissue. One of these, about 4 cm. in diameter, was near the liver border but did not involve it, and a narrow, sharp-edged margin of liver tissue could be palpated below the elevated nodule.

Laboratory findings included blood Wassermann test ++++, and moderate secondary anemia; all other laboratory findings were essentially negative. Under antisyphilitic treatment the patient improved rapidly and left the hospital with the admonition to continue treatment in one of the outpatient clinics.

Case V.—Mary M., a white female aged thirty, entered the Cook County Hospital with the complaints of dyspnea and orthopnea, edema of extremities, and abdominal enlargement. She gave a history of rheumatic fever eight years previously.

Physical examination revealed a moderately cyanotic individual with marked dependent edema. The area of cardiac dullness was enlarged to the right and left. Heart rhythm was absolutely irregular and murmurs were heard in systole

and diastole. The liver was palpable a full hand's breadth below the costal margin; it was firm, smooth of surface, sharp of edge, and tender on pressure. The liver border was essentially straight and parallel to the position of the normal border, extending obliquely upward to the left. The picture was that of the enlarged liver of passive congestion from heart decompensation in its progressive stage.

A good deal may be learned concerning the course or stage of the disease by *careful palpation of the liver.* While congestion is increasing and the liver is increasing in size, the patient usually complains of spontaneous low-grade epigastric pain and of rather marked tenderness over the liver. When the swelling of the liver begins to decrease, the spontaneous pain disappears but the tenderness persists, though gradually decreasing as the liver becomes smaller. The liver which is increasing in size or remaining at its maximum degree of engorgement, is firm and sharp-edged. As soon as the liver swelling begins to recede, the liver becomes less firm and its thin edge no longer stands out firmly and sharply against the palpating hand. When, therefore, in a cardiac patient we palpate a liver which is materially enlarged but not firm or sharp-edged, we may conclude that the patient is decompensated but that his condition has improved sufficiently to allow some diminution in the degree of liver engorgement. Long-continued passive congestion results in an increase in fibrous tissue, and the liver in which this has occurred will not recede to normal size. When much of this fibrous tissue has developed, subsequent episodes of decompensation cannot lead to the usual degree of liver swelling because of the limitation of liver enlargement imposed by this fibrous tissue.

COMMENT

It is probable that the greatest number of diagnostic errors in the examination of liver enlargements result from too hasty examination and too little attention to detailed findings. In my ward rounds I have usually found that internes and student clerks spend far less time upon the palpation of abdominal masses than do the attending physicians or consultants.

If one would derive the maximum amount of information from his examination, he must carefully inspect each detail of

contour and carefully palpate every accessible portion of margin and surface of the structure under investigation. If the examiner has taken advantage of every opportunity to inspect and palpate pathologic specimens at the autopsy table or at laparotomy, he is likely to discover that detailed physical findings take him a long way on the road to diagnosis.

Medical Clinics of North America
January, 1940. Chicago Number

CLINIC OF DRS. ITALO F. VOLINI AND WILLIAM W. SHAPIRO

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RECENT ADVANCES IN THE DIAGNOSIS AND TREATMENT OF DISEASE OF THE PANCREAS

RECENT advances in the diagnosis of diseases of the pancreas are due almost entirely to refinements of medical judgment, for with few exceptions the methods of precision now available have been employed for many years. Diseases of the pancreas, although not uncommon, have been and still are frequently overlooked. Diagnosis is difficult because: (1) the pancreas is deep seated and inaccessible to direct examination, (2) early manifestations of dysfunction are delayed by the "factor of safety" in the gland—the large amount of reserve pancreatic tissue present, (3) precise technical studies of pancreatic functions are difficult, and (4) not all pancreatic functions are known, an exceedingly important hindering factor in skilled diagnosis and management of disease of this organ.

Excluding diabetes mellitus, a concept of pancreatic diseases should include:

1. Acute necrosis
2. Acute and subacute inflammations
3. Chronic inflammation (including atrophy and stones)
4. Neoplasms
5. Cysts

DIAGNOSIS

The description of *acute necrosis* by Fitz[1] in 1889 still remains classical: "The common symptoms of acute pancreatitis are suddenly severe, often intense epigastric pain, without obvious cause, in most instances followed by nausea, vomiting, sensitiveness, and tympanitic swelling of the epigastrium.

There is prostration, often extreme, frequent collapse, low fever, and a feeble pulse—. If the case does not end fatally in the course of a few days, recovery is possible—."

Acute, simple inflammation is included in a newer concept of pancreatic disease and differs from acute necrosis only in the mildness of its course. It has been called acute "pancreatic edema,"[2, 3, 4, 5, 6, 7, 8] "acute interstitial pancreatitis," "acute transient disease of the pancreas," and "subacute pancreatitis." Anatomically, there is a glossy edematous infiltration and induration of the pancreas and surrounding structures; microscopically, there is a marked interstitial and interlobular edema, often with leukocytic infiltration.[2]

This condition could conceivably progress into an acute severe necrosis, after one or more attacks, or could arrest itself spontaneously with or without recurrences.[2, 4] Acute simple pancreatitis, whether it is due to fulminating, developing necrosis, collapse and death, or whether it is due to an edema which lasts a shorter or longer time, usually produces the same symptoms as an acute necrosis. The only difference is the greater degree of collapse, severer acuteness, and morbidity in the latter state.

The *symptoms of acute pancreatitis* may present mild to moderately severe dyspeptic disturbances. Usually they are severe and have a sudden onset with intense pain of a boring nature, often intermittent, in the left side of the epigastrium, which may radiate to the back or either shoulder. This may be accompanied by nausea, vomiting, varying degrees of tenderness and rigidity of the upper abdominal muscles, and marked prostration. Shock may be present but it is not pronounced. This syndrome is frequently associated with gallbladder disease, some form of which is present in about half the cases.[8] In the average patient the severest symptoms will have subsided after one or two days and may disappear entirely in a week.

The symptoms of *chronic pancreatitis* may be even more difficult to recognize than those caused by acute episodic disease. Many cases exist which give no findings, and yet the patient's health may be considerably impaired. Vague pains or belching alone may be present. It is in the chronic type of disorder that the "factor of safety" intervenes and renders

difficult the recognition of the disease process. Epigastric pain, loss of weight, hyperglycemia of an intermittent nature, and bulky, offensive fatty stools will at least direct attention to the pancreas. Rarely a pancreatic lithiasis may be associated with signs of chronic inflammation. Acute colicky symptoms, and signs of acute pancreatitis, may develop from time to time.

Tests of precision used to investigate pancreatic function have a limited value. In acute pancreatic diseases, great emphasis has been focused on the presence of pancreatic ferments in the blood and urine.[4–19] In these conditions the content of amylase rises almost instantly to values which may be considerably higher than normal and then declines in twenty-four to forty-eight hours to a normal level; or the decline may be gradual over a period of seven to ten days. Except in fulminating acute necrosis where destruction of the tissue is very pronounced or total, preventing the formation of ferments,[7] a high amylase value is characteristic of pancreatic disease and is found with pancreatic injury, trauma, necrosis and duct obstruction. Normally, amylase is present in greater quantities in the urine than in the blood, the ratio being fairly constant in any one individual but varying in different individuals.[16] As the amylase values increase, the high urine to blood ratio of ferment persists, but the high levels continue frequently twenty-four hours longer in the urine than in the blood. Urinary amylase determinations may, therefore, give even more information than the blood examination.

An *amylase unit* is the amount necessary to reduce 1 cc. of 0.1 per cent starch solution incubated at 38° C. for thirty minutes.[9] We use a simple modified Wohlgemuth technic for determining urine amylase and our values for normal individuals range from 15 to 60 units per cc. The test is very simple and requires less than an hour to perform.

Amylase tests performed in widely scattered laboratories yield different normal values, and the standards of comparison are therefore rendered difficult. In doing amylase tests, the most important factors that might affect the end results are the *p*H of the starch solution, the percentage of iodine in the solution used to determine the end point of titration, and the number of such drops used. An almost colorless solution may result when 3 drops of 0.06 per cent iodine solution are used

for titration, but a definite blue color may result when 5 or 6 drops are used. This can be readily demonstrated. More uniformity of technic should therefore be employed in all laboratories using these procedures, and amylase values in normal controls thus standardized. In our laboratory a urine amylase of 100 is considered very high and rightly pathologic, yet reports of thousands of tests done in European clinics designate diastase levels up to 300 as normal.[15]

Since the high amylase values often subside after twenty-four hours, it is important to make the tests at the height of the symptoms. *Blood amylase determinations,* as done by the saccharogenic method,[20] are expressed as mg. of glucose per 100 cc. of serum. Normal levels range from 80 to 180 mg. Pathologic states range up to 3000 mg. per cent. In the same normal individual the values are remarkably constant. Any apparent advantage in doing blood instead of the urine examinations is offset by the fact that a urine examination requires less than one hour while blood examination may take several hours, and involves two separate sugar determinations.

Blood lipase tests have been developed on a practical scale,[21, 22] and are possibly more reliable for determination of acute pancreatic disease than the diastase tests.[18] Lipase estimations, although not difficult, require twenty-four hours. They are therefore impractical as emergency procedures but should supplement the diastase tests. Lipase rises promptly after the onset of pancreatitis, and a fall occurs between two and three days, with a return to a normal level in most instances in two to three weeks. Lipase rarely is found increased in biliary tract disease except perhaps where there is an associated acute pancreatitis.

Other types of examination, except surgical exploration, are not of particular significance at the present time in furthering the recognition of acute pancreatitis.

In *chronic pancreatitis,* one must depend on examination of either the *duodenal contents* or the *stools.* The latter test is unreliable, because, occasionally, fat digestion may be unimpaired even with an almost total absence of pancreatic secretion.[23] Very large stools with a nitrogen loss exceeding 3 gm. in twenty-four hours suggest pancreatitis rather than sprue.[24] Examination of the duodenal contents should emphasize the

output of pancreatic enzymes over a period of time, paying particular attention to the tryptic and lipolytic ferments.[25] This is probably much more significant than single estimations of concentration of enzymes in the duodenum. Determinations of blood or urine enzymes are of little value in chronic pancreatitis except when an acute exacerbation occurs.

Glycosuria is a very inconstant finding in both acute pancreatitis and necrosis, occurring in less than 10 per cent of the cases. In the interacinar type of chronic pancreatitis, the incidence of hyperglycemia and glycosuria is usually great, and when associated with the findings of disturbed external secretion, the diagnosis becomes very apparent. Glucose tolerance tests give suggestive evidence of adenomatous involvement of islet tissue. Rarely, there may be a very extensive involvement by carcinoma of the islet tissue, with all of the symptoms of neoplasm plus hyperinsulinism.

Refinements of procedure in *x-ray examination* have not yielded any assistance in acute pancreatic disorders, except with an associated pancreatic lithiasis. In determining chronic enlargements of a cystic, neoplastic, or inflammatory variety, much information has been obtained, although the differentiation of the nature of the swelling cannot be revealed by the x-ray alone.[26] In many instances the degree of accuracy must be questioned because the diagnosis depends on the secondary effects of the tumor on the stomach and duodenum. There may be enlargement of the duodenal curve, and displacement of the bulb and pylorus upward and to the left (rarely in the opposite direction); the stomach and duodenum may be displaced forward. Laterally, there may be compression from behind with forward displacement. A tumor invading the duodenal wall may produce constriction with dilatation proximal to the point of narrowing. Occasionally there is an unexplained slowing of gastric and ileal peristalsis.

The foregoing findings, however, could be produced by any retroperitoneal enlargement or disease of adjacent viscera. An interesting x-ray procedure has been devised to indicate enlargements of the pancreas, particularly when other means of examination have failed:[27] The administration of an effervescent powder to an individual on an empty stomach distends the latter with gas. A lateral x-ray picture taken at once shows

widening of pancreas shadow which normally has the same diameter as a vertebral body. There may be a ventral displacement of the stomach with bulging of tumorous nodules, or a prominent convex surface protruding into the gas-filled area. Anteroposterior views may likewise give suggestive information. This procedure seems very effective in all except short, heavy-set individuals, and gives promise of revealing information concerning swellings of the body and tail of the pancreas which might otherwise go unrecognized.

Pancreatic cysts do not occur as frequently as pseudocysts. The latter follow trauma, and consist of serous or bloody fluid plus pancreatic secretion into the lesser peritoneal sac. Where a cyst or pseudocyst is intimately connected with the secretory substance of the pancreas, acute episodes suggesting acute pancreatitis occur frequently. Rarely, the usual manifestations of chronic pancreatitis may occur. A recent experience illustrates this chronic manifestation with recurrent acute episodes:

J. S., colored, aged thirty-one, stated that four years previously he was struck in the epigastrium and fell down a flight of stairs. Two years previously he had an attack of gastric distress lasting two to three days, following a heavy drinking orgy. In the past two years he has had five attacks of pain in the epigastric region radiating to the back, followed by vomiting which gave some relief. He entered the hospital with abdominal pains of one week duration. The pain was epigastric, burning, radiating to back, and was relieved by vomiting, which occurred two to three times daily. Sitting up relieved the distress. Eating and drinking intensified the discomfort.

The essential findings were: marked tenderness in the epigastrium, active peristalsis, and a large soft mass in the left hypochondrium. There was a low-grade fever. The hemoglobin was 65 per cent, and the red blood cells 4,600,000 and the leukocytes 14,000 per cu. mm. The free acidity was 0, the total 15. The Wassermann reaction was negative. The stools were not remarkable. The urine diastase test was 184 units during a period of pain, and 24 in a pain-free period. Glucose tolerance tests were negative. *x*-Ray examination of the stomach revealed a large defect, evidently due to pressure posteriorly from an extrinsic mass.

The diagnosis was traumatic pseudocyst of the pancreas. Laparotomy was performed by Dr. Karl Meyer. There was a large pseudocyst involving the tail of the pancreas. The cyst was anastomosed to the gallbladder after the latter was mobilized. The patient has apparently made an uneventful recovery four months since operation.

The *differential diagnosis of acute pancreatitis* involves primarily those conditions which produce pain in the upper abdomen. Acute fulminating necrosis and acute pancreatic edema may have the same symptoms. Biliary colic may produce these symptoms, too, and this may be all the more confusing when one realizes that the biliary disorder may have associated with it some pancreatic edema, and thus the exact cause of the pain will not be revealed. In 50 per cent of cases of edema of the pancreas there is some gallbladder involvement, yet there are many cases of operated acute pancreatitis which show no disease of the gallbladder.

A similar syndrome can be caused by peptic ulcer. This is particularly confusing when one is confronted by a penetrating or ruptured ulcer in a middle-aged person who never had an ulcer history. Sometimes a known peptic ulcer may perforate onto the pancreas and confuse the diagnosis. This was brought out by Meyer and Amtman,[28] and Probstein, Gray and Wheeler.[29] The symptoms of acute pancreatic disease are thus added to those of perforating ulcer.

Coronary disease, intestinal obstruction, or any severe colic may cause confusion.[7] Clinical consciousness of the possibility of acute pancreatic disease, thorough immediate study of the patient's history, a careful physical examination, and immediate use of all available procedures that will not tax the patient's strength, are most important in recognition. If the symptoms suggest biliary disease, elevation of serum amylase, and particularly elevation of serum lipase, will point to an associated involvement of the pancreas. High values for amylase should be considered pathognomonic of acute involvement of the pancreas, and their absence should exclude the existence of an acute pancreatic involvement, except, as previously stated, where total destruction of this organ occurs. The presence of high ferment values in gallbladder disease, pancreatic cysts, carcinoma of the pancreas, and rupturing peptic ulcer, must

be evaluated on the basis of the combination of the disease processes.

The *differential diagnosis of chronic pancreatitis* includes conditions associated with a debilitated state and those characterized by diarrhea and fatty stools. Chronic inflammation may be extremely difficult to distinguish from pancreatic carcinoma because of frequent identical symptoms and findings. Even when the pancreas is exposed at operation, examination of a tissue section may be necessary, for the swelling and nodular induration of a pancreatitis involving the head, and producing signs of biliary compression, will simulate a neoplasm.[30]

The fatty stools of pancreatitis may resemble those of *idiopathic steatorrhea*. Neutral fat is present in large amount in the stool of chronic pancreatitis, but this alone is not sufficient for diagnosis. In pancreatitis, there is often an azotorrhea of over 3 gm. per day.[24] The glucose tolerance curve, rarely diabetic, will be normal or show some elevation of glucose values over the normal in contrast to the flat curve of sprue or celiac disease.[31] The concentration of duodenal ferments over a period of time will be much less than the normal, and hyperchromic anemia is usually not characteristic of pancreatitis.

It is to be recalled that the external pancreatic secretion with all its proenzymes is induced by the stimulation of the hormone called "secretin" which is produced by the mucous membrane of the duodenum. This hormone is carried to the pancreas by the blood. Activation of the proenzymes of the external pancreatic secretion, particularly the trypsinogen, is by enterokinase, produced in the cells of the mucosa of the small intestine, active trypsin resulting. Disturbance of the physiologic mechanism can result from chronic intestinal disease. This indicates the reason for the very similar clinical syndromes observed in chronic pancreatitis and in the so-called diseases of intestinal absorption.

The *differentiation of pancreatitis from other conditions producing a diarrhea* involves the same technical procedures as outlined in the foregoing. In addition, where a pancreatic deficiency exists, the response to pancreatic extracts or enzymes may improve the patient sufficiently to demonstrate pancreatitis to the exclusion of other conditions.

Chronic pancreatitis may exist without any startling findings, and in such instances diagnosis may be difficult. Chronic dyspeptic disturbances warrant thorough, prolonged study, and if the possibility of pancreatic disease is kept in mind, some clue will inevitably appear that may reveal the true nature of the condition.

The *functions of the pancreas* have not been thoroughly explored. For instance, it has been long known that depancreatized dogs succumb to fatty changes in the viscera, particularly the liver, unless given whole pancreas as well as insulin. Diabetics commonly have liver enlargements, and in cases of pancreatic atrophy, liver enlargement is often pronounced. Lecithin, and particularly choline, were found to relieve this condition in the diabetic animal. The work of Dragstedt, Van Prohaska, and Harms[32, 33] demonstrated the presence of an alcoholic-soluble substance in the pancreas, named by them "lipocaic" (not present in the external pancreatic secretions) which, when given by mouth or by injection, is capable of controlling this abnormal fatty metamorphosis. Whether the isolated substance is[34] or is not[35] specific, and regardless of whether it depends on its choline and protein content[36] for its specificity, a new avenue of therapy has nevertheless been opened for the treatment of hitherto uncontrollable conditions.[37–42]

Carcinoma of the pancreas begins insidiously and is often mistaken for psychoneurotic disturbances, particularly where the involvement is maximal in the body or tail of the organ. Boring, deep-seated pain, often of a mild character, may be the only finding for a long time[43] and here especially, early recognition depends on the diagnostic acumen of the clinician. Neither glycosuria nor gallbladder enlargement is present in any large percentage of cases. Weight loss is most significant.

Rarely, tumors of the pancreas may occur (either of a benign or highly malignant character) whose outstanding symptoms are referable to an *overproduction of insulin*.[44, 45] Reports of such cases are rapidly increasing. The tumors may be simple adenomata, single or multiple, involving islet tissue; and they are often easily removed surgically with excellent results.[46] Spontaneous hypoglycemia has been arrested or

relieved in some instances by extensive resection of the pancreas, even in the absence of demonstrable adenomata.[47]

TREATMENT

The treatment of *acute pancreatitis* is essentially medical.[48, 49] In any event the problem is fundamentally medical. It should hold the interest of the internist first, and the surgeon last.

Conservative medical therapy promises the best results in all types of acute pancreatic involvement.[8, 50, 51, 52] The consensus of opinion seems to be that non-operative management is the best available procedure except in those patients with acute necrosis who subsequently show signs of suppuration. Where a differential diagnosis exists between peptic ulcer and pancreatitis which cannot be exactly determined, if pancreatitis is found on exploration, simple closure of the abdomen is probably the safest procedure. Prophylactic surgery on the biliary tract should be attempted, particularly with a previous history of biliary colic associated with high amylase or lipase levels. The best medical treatment is bed rest, morphine, intravenous glucose, and no food by mouth. Orderly surgical procedures may then be attempted, if deemed advisable, on the biliary tract of patients who will be better prepared to withstand the trauma of operation.

Carcinoma of the pancreas remains a surgical problem. Total excision of the pancreas by the technic of Whipple[52] offers some hope of prolonging the patient's existence. Radiotherapy,[54] possibly, is effective in keeping patients alive longer where surgery is not feasible. Surgical excision of non-cancerous islet-cell tumors has yielded excellent results. Extensive resection of the pancreas has relieved hyperinsulin symptoms where an adenoma could not be found.

Cystic disease of the pancreas usually demands some surgical interference. If an old hemorrhagic or necrotic cyst is large and involves a large portion of the gland and resection is not advisable, an excellent procedure is an anastomosis between the cyst and the gallbladder. In most instances the end result is superior to the older surgical measures such as marsupialization.[55]

Pancreatic lithiasis, when recognized, usually requires only

a conservative medical management.[56, 57] If severe colic or secondary suppuration occurs, surgical interference may be indicated. Signs of pancreatic deficiency may be associated with the presence of stones requiring the usual therapy for chronic pancreatitis.[58]

Chronic pancreatitis is often favorably affected by correction of biliary tract disturbances. A diet high in carbohydrate and vitamins,[59, 60] supplemented by raw pancreas or enzyme extracts, influences the patient's condition very favorably. Prepared dry extract of whole pancreatic juice from pancreatic fistulas in dogs, used continuously, has been successful in combating the symptoms of chronic pancreatitis.

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Medical Clinics of North America
January, 1940. Chicago Number

CLINIC OF DRS. JAMES B. EYERLY AND HERBERT C. BREUHAUS

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DIAGNOSIS AND TREATMENT OF INTESTINAL TUBERCULOSIS

OF all forms of tuberculous infection, that of the intestinal tract still remains one of the most difficult to diagnose. It is not commonly encountered in general practice and is most frequently associated with pulmonary tuberculosis. Occasionally, however, the symptoms accompanying the tuberculous enteritis are the first to give warning of an unnoticed pulmonary lesion which may be the primary source of the infection.

Not all forms of intestinal tuberculosis are the same. When speaking of these lesions one should clearly define the type under consideration. The following French classification of tuberculous enteritis to our notion seems complete and clear:

1. The ulcerating type.
2. The stenosing type.
3. The enteroperitoneal type.
4. The hypertrophic type.

ULCERATING TYPE OF TUBERCULOUS ENTERITIS

The ulcerating type is by far the most common and is usually secondary to a pulmonary focus. Such involvement is thought to be due to the tuberculous diathesis present in the individual, along with contact of the intestinal mucosa with numerous bacilli which are constantly being swallowed. Regardless of precautions a certain number of bacilli will be admitted to the intestinal tract, especially during the more active phases of the pulmonary lesion. Digestive juices in the stomach and small intestine do not act upon these organisms which may readily penetrate the intestinal mucosa. As would be expected, the incidence of involvement is highest in those

regions of the small and large intestine where most stasis and absorption occur. For this reason the *terminal ileum* and *cecum* are the most common sites of this infection, although it may occur in any portion of the intestinal tract without involving either of these regions.

Diagnosis.—The difficulties in arriving at an accurate diagnosis of this condition are responsible for the great difference of opinion as to the frequency of its occurrence. There is no characteristic symptom complex which indicates this complication. The appearance of *abdominal discomfort* or a *change in bowel habit* should be regarded with suspicion. Many times a diagnosis of intestinal involvement is made from these symptoms alone. Further study is imperative to eliminate functional as well as other organic complications. Even though no disease process can be demonstrated, the likelihood of intestinal tuberculosis is not eliminated because, not infrequently, these symptoms disappear as the pulmonary lesion heals (Brown and Sampson).

The presence or absence of *tubercle bacilli in the stools* is of little help in diagnosing this lesion in the intestinal tract. Occult or gross blood and leukocytes may be found in the stools, yet their absence does not preclude an ulcerative process.

Examination for *parasites* and *culture for dysentery bacilli* must not be omitted. Sigmoidoscopic examination in most instances is of little value since the lower colon and rectum are not commonly involved.

x-Ray examination is an invaluable aid in diagnosing this disease. Fluoroscopic observation of the course of the barium meal through the small intestine and colon is the usual procedure. This may be the only means of locating an organic defect in the small intestine, but frequently only localized regions of increased irritability are observed. Such an examination requires a highly expert and experienced observer and, though an irritable region is found, a functional disorder is not disproved. The barium enema is useful when advanced changes are present in the large intestine and aids in differentiating this infection from other organic diseases. It must be remembered that lesions demonstrated by *x*-ray are considerably advanced and thus a minimal lesion may be overlooked. It is the early, beginning phase which is most in need of treatment and

no single procedure can be relied upon to furnish sufficient evidence as to its presence.

In considering the *incidence* of this lesion, statistics from postmortem examinations are valuable but they represent end results. Data from clinical studies are also useful, but these vary widely largely because of the uncertainty of diagnosis. Before refinements in diagnosis were available it was believed that any patient suffering from this type of complication had little opportunity to recover. Today we know that many patients who have had a tuberculous enteritis have recovered. In those who come to autopsy we would naturally expect to find a high incidence of tuberculous enteritis because of the debility and heavy seeding of the intestinal tract from the pulmonary infection. Involvement frequently is not found by gross examination of the intestinal surfaces; microscopic examination of the lymphatic structures is often required to determine its presence. When microscopic studies of the bowel wall are necessary at postmortem, it does not seem likely that an *x*-ray study of this region would be very significant.

Treatment.—The treatment of this condition must be primarily directed at the pulmonary lesion. Modification of the usual *diet* is necessary to reduce the discomfort produced by the intestinal involvement. It must be recognized that even functional disturbances of the bowel are aggravated by certain foods and the diet should meet the individual's requirements. When distressing symptoms of abdominal pain and diarrhea are present it is necessary to avoid foods which stimulate peristalsis. It may be desirable for a time to eliminate from the diet ices, ice cold drinks, raw fruits, and raw vegetables, as well as cooked foods containing excessive roughage. If constipation is present the general diet should be modified to include sufficient bulk to overcome this condition. Adequate mineral and vitamin intake is essential. In those cases where the diet must be limited, the vitamin deficiency can readily be overcome by using the synthetic preparations. The healing of any disease process is hastened by keeping the patient free from discomfort.

It is customary to prevent chilling of the abdomen by wearing a *flannel abdominal binder*. When abdominal pain is present, warm moist abdominal packs are useful.

Antispasmodics, depending upon the degree of diarrhea and discomfort, may be necessary. Tincture of belladonna or opium is commonly employed. Calcium, either by mouth or intravenously, is thought to be a valuable aid in the general therapy.

The patient should be instructed to *expectorate saliva* and all material brought up by coughing. Chewing paraffin is recommended by some as a useful preventive in swallowing bacilli.

Heliotheraphy and *ultraviolet irradiation* are used extensively and seem to be valuable additions to the therapy. Injection of air or oxygen into the peritoneal cavity is advocated by some, who consider this procedure an aid in limiting the movement of the diaphragm, thus benefiting the pulmonary lesion.

Surgical treatment of this condition is chiefly confined to relieving complications as a result of perforation.

STENOSING TYPE OF TUBERCULOUS ENTERITIS

The stenosing type is most frequently seen in children as a result of a primary infection rather than due to secondary ulceration. These strictures may be multiple, and as many as twenty have been counted between the duodenum and cecum (Brown and Sampson). Such stenoses not uncommonly result from healed "circle ulcers," as seen in the ulcerating form. Instead of a circular scar the obstruction us usually caused by adhesions which produce numerous bowel kinks.

Diagnosis.—Before the onset of the intestinal difficulty, the patient rarely presents a history of tuberculous infection. The onset of obstructive symptoms may be acute and severe, or a history of intermittent mild obstruction over a long period of time may be obtained. The findings are those of any other type of bowel obstruction, and when a positive tuberculin test is present in a young individual, the possibility of this type of pathology must be considered.

Treatment.—The treatment of this form is *surgical.* Removal or separation of the adhesions responsible for the obstruction should be attempted if necessary. It may, however, be desirable to make a side-to-side anastomosis if removal of dense adhesions is impractical.

ENTEROPERITONEAL TYPE OF TUBERCULOUS ENTERITIS

Diagnosis.—The enteroperitoneal type of tuberculous enteritis is not common, and may be due to either the primary or secondary type. In this form there is little if any superficial erosion of the intestinal mucosa, but the lymphatics of the bowel wall, peritoneum and mesentery are the site of infection and the characteristic picture of peritoneal tuberculosis, with or without the formation of ascitic fluid and adhesions, occurs. In the adult it is often difficult to distinguish from cirrhosis when fluid is present. If a doughy tender mass which presents areas of alternating resonance and dullness is present, the obliterative form is to be suspected. In the differential diagnosis peritoneoscopy is of particular value in establishing the presence of this lesion.

Treatment.—The treatment of this type of tuberculous enteritis is similar to that found useful in treating tuberculosis in general. The condition tends to disappear spontaneously. Frequently a laparotomy is necessary to establish a diagnosis; this procedure alone is often followed by a cessation of symptoms. When excessive fluid is present, aspiration may be performed and laparotomy done later if necessary.

HYPERTROPHIC TYPE OF TUBERCULOUS ENTERITIS

The hypertrophic type is rare and most frequently found in the ileocecal region. Only a small proportion of this form is related to tuberculosis in some other part of the body (Boyd).

Diagnosis.—This type is commonly found in patients near thirty years of age. The submucosa and muscularis show a low grade chronic inflammatory change with much thickening, so that a palpable mass is found in about 65 per cent of cases when the patient first seeks medical attention. The most common *symptoms* are those of subacute intestinal obstruction with intermittent attacks of intestinal colic, a tendency to constipation with occasional attacks of diarrhea, and periodic appearance of red and white blood cells in the stools. *x*-Ray study is invaluable in the diagnosis of this condition. Ulceration may occur but is usually not marked. Frequently the tumor cannot be differentiated from carcinoma even after the abdomen is opened. Since this type of inflammation is of such

a low grade nature, there has been much speculation as to the bacillus responsible. Many consider the bovine variety as the causative agent, because this form of tuberculosis is more common in Europe than in this country where bovine tuberculosis is under better control.

Treatment.—The treatment of this lesion is *surgical,* after general measures have produced a maximum improvement. Resection of the involved portion of the bowel should be attempted if this can easily be done. Most observers agree that, when the lesion is extensive or the condition of the patient unfavorable for resection, a lesser procedure is the operation of choice. By establishing a short circuit the mortality is considerably reduced and the end results are essentially as favorable as those accomplished by resection. Often a minor surgical procedure is done as a palliative measure, with such good results that further treatment by resection seems ill advised.

ILLUSTRATIVE CASES

Case I.—M. N., a white woman aged twenty-seven, married, a housewife, entered the hospital because of a cough and diarrhea. About eight months before admission she had a severe upper respiratory infection which left her with a persistent cough. This cough was non-productive during the day but, upon arising in the morning about one teaspoonful of mucopurulent material was raised. This cough had become progressively more severe. There was no weight loss, no night sweats, and no fever had been noted, but she tired easily and a dull frontal headache had set in.

Her bowel function had always been considered normal until six months previously when she began to suffer from generalized abdominal cramping, with two or three mushy explosive stools each day. This distress occurred at irregular intervals, was partly relieved by taking warm food, and unaffected by bowel movement. At times there was much rumbling and gurgling heard in the abdomen. Stool passage was usually accompanied with much flatus, but no blood or mucus was ever noted. There had been no nausea or vomiting and the appetite was good. Systemic inventory revealed nothing else worthy of note. The family history was negative.

On physical examination the patient appeared moderately undernourished but not acutely ill. The chest muscles were atrophic and the supra- and infraclavicular fossae were pronounced. Krönig's isthmus on the right was narrowed. Crepitant râles were heard over the upper half of the right lung, and upon coughing these could be heard over all portions of both right and left lungs. The abdominal walls were held tightly. Sigmoidoscopic examination revealed nothing worthy of note.

The pulse and temperature remained within normal limits during her stay in the hospital. Urine examination was normal. Hemoglobin (Dare) was 78 per cent; there were 4,000,000 red blood cells and 13,500 white blood cells per cu. mm. Stools were mushy, acid, and showed a trace of occult blood. Both stool and sputum examination revealed numerous acid-fast bacilli.

A chest x-ray showed a bilateral increase in lung markings involving practically all of both lungs, most marked in the upper half of the right lung. The diaphragm shadows were clear and the heart shadow within normal limits. Colon fluoroscopy showed areas with irregular margins, indicating induration of the walls of the cecum, ascending colon and transverse colon, especially near the hepatic flexure. This was characteristic of tuberculous involvement.

After two years' care the pulmonary lesion has been arrested and the patient has gained 20 pounds. All signs and symptoms of the intestinal involvement have disappeared. This case demonstrates healing of the intestinal lesions with improvement in the pulmonary condition.

Case II.—Mrs. M. A., a white female aged forty, entered the hospital because of a diarrhea. A pulmonary tuberculosis had been present for nineteen years and she was frequently examined during that time. No acid-fast bacilli had been found in her sputum during the last two years.

About two years previously she began to suffer from periodic attacks of abdominal distention, belching and much flatus. Food or alkali did not affect this distress, but belching or bowel movement gave some relief. Later, severe cramping in the lower abdomen occurred; this was unaffected by belching or the passage of a bowel movement. Six months previous to exam-

ination the patient was given some brown tablets and eight to twenty liquid stools were passed each day. Belladonna relieved the abdominal distress, but the frequent bowel movements continued even after the brown medication was discontinued. Usually one or two of these movements contained obvious fecal material; the rest were a milky pink color with occasional blood clots. There was almost a constant desire to go to stool. She had lost 9 pounds since the onset of the diarrhea and a daily fever as high as 102° F. was present. Systemic inventory and the family history revealed nothing else of note.

On physical examination the patient appeared moderately pale, undernourished, and older than her age indicated. The pharyngeal mucosa was reddened and granular. Resonance and tactile fremitus over the entire left lung were diminished. Loud crackling râles were heard over the left lung and the upper half of the right lung. The abdominal walls were relaxed, and some tenderness to deep pressure was present in the right lower quadrant. On sigmoidoscopic examination the rectal mucosa appeared edematous, but no ulcerations or bleeding points were seen. Pelvic examination revealed an irregular indurated mass which flared out across the cul-de-sac from the left side and extended to the left pelvic wall. The right wall was free. This suggested a lesion of intestinal origin, probably of inflammatory nature.

The pulse rate was rapid and there was daily fever to 102° F. Urine examination was normal. Hemoglobin was 55 per cent (Dare), and there were 3,630,000 red blood cells and 9750 white blood cells per cu. mm. An Ewald test meal revealed 25 points of free and 47 points of total acid. Two to five liquid stools containing much mucus and many red and white blood cells were passed daily. Stool cultures for parasites and dysentery bacilli were negative. Several stools and sputum specimens were stained for tubercle bacilli and a few were found in one stool.

A chest *x*-ray showed the heart and mediastinal shadow deviated to the left. There was a diffuse clouding of the entire left lung, more dense in the upper half. Markings in the upper half of the right lung were also increased. This suggested a fibroid type of pulmonary tuberculosis.

Colon fluoroscopy revealed a filling defect, about 5 cm. in length, just above the rectosigmoid junction, involving the lower sigmoid which made a sharp angle to the right. The rest of the bowel filled normally, the cecum was free and movable, and a small amount of barium entered the small intestine. The irregular margins of the filling defect suggested an inflammatory process.

Because of the patient's poor general condition it was decided to treat her symptomatically. She was kept in bed at home for three months but failed to improve. When her fever increased and a severe hacking cough set in, she returned to the hospital. It was then found that a large cavity had formed in the upper left lung and the pelvic tumor had increased somewhat in size. Under morphine and scopolamine anesthesia, a needle was introduced into the cul-de-sac and a small amount of thick material was aspirated. A small incision was then made through the cul-de-sac and a finger introduced to the middle joint; this allowed a little more material, having a fecal odor and containing some of the iron which had been taken by mouth, to escape.

The patient's condition remained unchanged and, on the second day after the operation, there was a chill, the temperature rose to 103.2° F., coma followed, and within a few hours the patient died.

Autopsy revealed active bilateral pulmonary tuberculosis with a large cavity in the right upper lobe. The defect in the sigmoid colon previously described was found to be due to an adenocarcinoma with tuberculous ulceration on its surfaces. The pelvic mass was a result of perforation through the diseased bowel area and abscess formation.

This case is of particular interest because of the long-standing pulmonary tuberculosis without apparent intestinal involvement until complicated by a malignancy. No evidence of secondary ulceration was discovered except that associated with the carcinoma.

Case III.—M. S., a white male aged twenty-five, single, a bank clerk, had been in good health until two years ago when an operation for a rectal fistula was performed. This failed to heal and, one year later, a second operation was successful.

Tuberculous granulation tissue was found in the walls of the fistulous tract. About nine months after the last operation he began to suffer from considerable abdominal distention immediately after meals, and often upon arising in the morning. Passage of flatus, and belching produced with baking soda or warm milk gave some relief. Warm water enemas gave most relief. He had been in the habit of taking mineral oil daily for several years; recently this was discontinued because five or six formed to mushy stools were being passed daily.

The patient had become very irritable and apprehensive. Systemic inventory revealed nothing more, and except for mild attacks of the usual childhood diseases and an accidental fracture of the left leg and foot eleven years ago, the past history was insignificant.

On physical examination the surgical scars about the rectum were well healed and, except for periodic abdominal distention, nothing worthy of note was found. The patient's pulse and temperature remained within normal limits. Urine examination revealed no pathology. Hemoglobin (Dare) was 84 per cent, and there were 4,670,000 red blood cells and 12,000 white blood cells per cu. mm. Usually one mushy or soft-formed stool, which occasionally contained mucus, and gave a 1 to 2+ benzidine reaction, was passed daily.

x-Ray studies of the bowel were repeatedly unsatisfactory because of the large amount of gas in both the large and small intestine. The colon could not be filled completely, but the ascending portion and cecum appeared to have irregular margins and were narrower than normal.

The patient then gained 8½ pounds after three and a half weeks of medical management.

At operation the cecum and ascending colon appeared indurated and friable. The ileum and transverse colon seemed uninvolved. Both cecum and ascending colon were mobilized to the hepatic flexure and removed. Because of the extreme friability of the tissues of the transverse colon, an anastomosis with the ileum could not be made and ileostomy was performed.

The postoperative course was poor; considerable purulent drainage from the incision and an uncontrollable hiccough developed. The wound failed to heal and soon opened. Peritonitis followed and four weeks later the patient succumbed.

Gross and histologic study of the surgically removed specimen confirmed the clinical diagnosis of hyperplastic tuberculosis.

This case demonstrates that the gross appearance and texture of the bowel tissue may be deceiving. The involvement may be greater than originally recognized. If the obvious pathology is extensive, removal is contraindicated. In the above described instance an ileostomy alone should have been the operation chosen.

Case IV.—J. T., a white male aged forty-five, married, had noticed a sudden severe pain in his right testicle while stepping upon a curb seven months ago. On the day following this incident the scrotum became enlarged and soreness persisted. A physician aspirated a small amount of yellow fluid, but soon the swelling returned and he was advised to take a rest because a tuberculous infection was suspected. After three months this condition did not improve and a tuberculous right testicle was removed.

Shortly before the operation lower abdominal distress described as "gas pains" began to occur at more frequent intervals. These were intermittent, rhythmic in character, usually appeared in the early evening, and lasted for several hours. As a rule one or two large enemas were taken for relief; with these a small amount of stool and much flatus was passed. At times there was a sensation of fulness in the epigastrium soon after eating. The patient obtained partial relief by inducing vomiting. His appetite had been good, but the food intake was limited for fear of abdominal discomfort. Systemic inventory and past history revealed nothing more worthy of note.

On physical examination the patient appeared well-developed, but an obviously recent loss of weight was apparent. There was some diminution in breath sounds over the upper lobe of the right lung, especially in the apical region. The abdominal walls were soft, and a sausage-shaped tender mass, about 4 by 6 cm. at the level of the umbilicus in the region of the ascending colon, could be palpated. This mass could be rolled under the fingers and, when pressed upon, produced pain which radiated to the epigastrium and left lower quadrant in a manner similar to the distress previously described. There was no tenderness over any other portion of the abdomen.

The recent surgical scar on the right scrotum was well healed except for one small fistulous opening from which no material could be expressed.

The pulse rate was normal, and occasionally a low grade fever was present. Urine examination was normal. Hemoglobin was 77 per cent; there were 4,090,000 red blood cells and 11,600 white blood cells per cu. mm. Usually one mushy stool, occasionally showing a trace of occult blood, was passed each day. An Ewald test meal revealed no free and 6 points of total acid; normal ferments were present.

A chest *x*-ray disclosed slight clouding of the apex of the right lung and the left entirely clear. Colon fluoroscopy showed the walls of the bowel normal, until the barium enema reached the upper part of the ascending colon. Here there was a definite obstruction, through which a thin stream of barium passed for about 5 cm. and then widened slightly. This area of obstruction corresponded to the palpable mass.

At operation, the cecum and involved ascending colon were easily mobilized, although a mass of lymph glands adhered to the former. The ascending colon was ligated 7 cm. above the ileocecal junction and this with about 12 cm. of terminal ileum, was removed. A lateral anastomosis between the lower end of the remaining ascending colon and terminal ileum was then made.

Histologic study of the surgically removed specimen confirmed the diagnosis of hyperplastic tuberculosis. An uneventful recovery followed the operation, and there has been no recurrence of symptoms in fifteen years.

The genital and bowel lesions in this case were most likely latent manifestations of the arrested pulmonary infection. Comparatively little surgical manipulation was required in the resection and an excellent result was obtained.

Medical Clinics of North America
January, 1940. Chicago Number

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DIAGNOSIS AND TREATMENT OF SOME OF THE COMMON POISONS

BEFORE entering upon the discussion of some of the common poisons we should know the definition of a poison. A poison is a substance which, when introduced into or upon the body and absorbed into the blood stream and acting chemically, is capable of seriously affecting health or destroying life. This is the usual effect upon the healthy body. A substance which is ordinarily not a poison may become poisonous after the above conditions have been fulfilled.

There are *various conditions which may modify the action of a poison:*

1. *Solubility* of the substance, in water, acids, and also in body fluids and particularly in lipoids.

2. The *rate of absorption*, which in turn depends upon a series of factors, such as diffusibility of the substance, its physicochemical properties, conditions favoring solution or diffusion, and systemic conditions.

3. *Portal of Entry.* Absorption through the stomach is slow, whereas absorption through the respiratory tract occurs much faster. The skin can also absorb poison very rapidly. The author, for instance, has killed rabbits by rubbing wood alcohol to a shaved area on their backs. The genito-urinary tract has also been a frequent place of absorption of poisons.

4. *Concentration* of the poison.

5. The *rate of elimination.*

6. *Individual susceptibility*, which may be subdivided into an increased susceptibility, or idiosyncrasy, and a decreased susceptibility, or tolerance.

The general practitioner usually sees the case of poisoning first. The common poisons that he will come in contact with in the home are *carbon monoxide, arsenic, strychnine, barbiturates, carbolic acid, oxalic acid, lysol, cyanides,* and *mineral acids and alkalies;* in industry the worker comes in contact with *lead, carbon monoxide, solvents, acids and alkalies, metallic dusts* and *fumes.*

Causes of Home Poisonings.—Home poisonings include those which occur as the result of a mistake, carelessness, or ignorance. *Oxalic acid poisoning* oftentimes results from the ingestion of the contents of unlabeled or erroneously labeled bottles. Accidents have occurred in homes where bottles containing oxalic acid have remained unlabeled after some of it had been used for the removal of ink stains from linen. Oxalic acid is easily confused with Epsom salts, to which it bears a close resemblance.

Several cases of poisoning have also been recorded as the result of *carelessness in handling and disposing of medicinals.* Children may inadvertently swallow with fatal results substances such as Hinkle pills, mistaking them for candy.

Decoctions of tobacco are sometimes used as insecticides in the country. These decoctions are oftentimes kept carelessly in unlabeled whiskey bottles and may be ingested by accident. *Acute nicotine poisoning* results and death occurs very rapidly.

Diagnosis of Poisoning.—The diagnosis of poisoning before death is many times easy, sometimes difficult and, with the present methods, occasionally impossible. A proper diagnosis is of the utmost importance so that appropriate treatment may be instituted.

Why is it impossible to make a diagnosis in every case? First, because there are too many new drugs and chemicals introduced each year and added to our long and overburdened list of therapeutic measures. Second, the task of diagnosis is made difficult because of the paucity of knowledge of poisons among doctors. This lack of knowledge regarding poisons is partly the fault of medical colleges which fail to stress the teaching of materia medica and toxicology.

In arriving at a diagnosis of poisoning, a *careful history is a prerequisite,* as in the diagnosis of disease. A suspicion

of acute poisoning should be entertained if any individual who had been previously in good health *suddenly* becomes ill with *symptoms rapidly increasing in severity*. This suspicion always increases if the symptoms appeared a short time *after partaking of food, drink,* or *medicine*.

If the symptoms agree with those of a group of poisons and can be differentiated from a disease, our suspicion becomes firmly fixed. However, it must be kept in mind that *certain diseases closely simulate certain poisons:* The irritant poisons may be simulated by gastro-enteritis, gastric and intestinal ulcers, acute indigestion, appendicitis, intestinal obstruction, and peritonitis. Narcotic poisoning may be simulated by epilepsy, apoplexy, cerebral hemorrhage, certain heart diseases, inflammation of the cerebral spinal system, uremia, etc.

In acute poisoning, a careful examination will many times enable a physician to make an immediate accurate diagnosis. The *color of the face,* if of a deep pink or red, would lead one to suspect the presence of carbon monoxide or cyanide. Evidence of *corrosion* on the lips, tongue, mouth, and throat would lead one to suspect that a corrosive poison had been taken. The *odor of the breath* will oftentimes give important clues, showing that cyanide, phenols, alcohol, chloroform, or other odoriferous substances have been taken.

The most important of the common poisons will now be discussed.

LEAD POISONING

Lead poisoning has been known for centuries, even by the early Greek and Roman physicians, and it was Hippocrates who first incriminated lead as the cause of certain symptoms.

Industrially, lead poisoning occurs chiefly in the manufacture of lead pigments, battery plates, painting, plumbing, printing trades, glazing china and porcelain ware, covering cables, bearing metals, smelting and refining of lead, and in any industry that uses lead in the process of its manufacture. Poisonings are also frequent in automobile industry, where solder is used on automobile bodies. In this connection, it is interesting to mention that the Negro race seems to be more susceptible to lead poisoning than the white race.

Lead poisoning in homes has occurred in connection with drinking water. In newly constructed houses the lead content

of drinking water may amount to 5.3 mg. per liter in the morning, and 3.5 mg. per liter during the day. Fairley[1] has observed cases of poisoning occurring in infants who were poisoned from the use of toilet water containing lead. A number of lead poisoning cases occur also in small infants who chew on the framework of their cribs, and from toys and woodwork painted with lead-containing paints. Lead shields worn by nursing mothers have been a source of lead intoxication. The sale of lead shields should be prohibited and hospitals warned of the danger so that they can be discarded. Infants also have been poisoned by lead-containing face powder used by the nursing mothers. The usual symptoms in such cases were delayed teething, nervous symptoms such as convulsions, twitching and paralysis, diarrhea and constipation. Blood smears show the presence of basophilic stippling.

The greatest source of lead poisoning, however, is found among individuals employed in the smelting and refining of lead, in the manufacture of white lead, of paints containing lead pigments, automobile assembling plants, and in any process where lead is volatilized. Poisonings also occur frequently during the process of burning off paints containing lead.

Lead poisoning appears more rapidly and intensely by the inspiration of lead-laden air than by the gastro-intestinal route. Lead given by stomach tube to dogs can be largely recovered in the feces, because most of the ingested lead is not absorbed and because the greater portion of the fraction that is absorbed is caught by the liver and re-excreted into the intestinal tract in the bile. Much of the lead that enters the gastro-intestinal tract is not absorbed into the organism, but is either eliminated directly or never passes beyond the liver. Lead poisoning may occur from the use of hair preparations containing lead acetate.

Diagnosis.—In arriving at a diagnosis of lead poisoning, the *occupational history* is of great importance. However, one must not place too much stress on this part of the history. The individual may have symptoms which were present before he became industrially employed in air contaminated by lead dust or fumes.

In my textbook are recorded twenty outstanding *signs and symptoms of lead poisoning:* Fatigue and weakness, loss of

[1] Fairley, K. D.: Med. Jour. of Australia, 1: 600, 1934.

appetite, and loss of weight were noted in all cases (100 per cent); headaches were noted in 91 per cent; pallor, or a sallow, pale complexion in 83 per cent; tremor of hands, tongue, or eyelids in 80 per cent; abdominal pain in 68 per cent; constipation in 68 per cent; and pain in muscles and joints in 58 per cent. The *lead line* was noted in persons with poor dentures; I have seen it in only 36 per cent of my cases. It is not a line but consists of small punctate dots on the gums between the teeth. A small hand lens aids in locating the dots, which are due to a deposition of lead sulphide. The *wrist drop* described in textbooks is rarely seen except in painters. *Pain in the muscles of the legs* is more frequent.

Diagnosis in the acute stages is made by a *smear stained either by the McCord or the Wright method.* The red blood cells are usually below 4,500,000, the hemoglobin below 78 per cent. The urine will show lead in excess of 0.08 mg. per 1000 cc. (McNally, Toxicology, page 161, 1937).

In every suspected case of lead poisoning the *blood examination should include:* the percentage of hemoglobin, the red and white cell count, and whether basophilic cells or stippled cells are present. A chemical analysis of the urine should be made for abnormal amounts of lead. Urine may contain normally from 0 to .08 mg. of lead per liter of urine. The elevation of blood pressure cannot be said to be due to the absorption of lead.

From the examination of many hundreds of patients it was found that 20.63 per cent not working with lead had blood pressures from 150 to 190, while 15.11 per cent of those who worked with lead from one to forty years had the same range of blood pressures. In one group of 438 men industrially employed, 28.66 per cent had blood pressures from 150 to 190 while, in another group, 30 per cent of the men working in lead had pressures of 140 or over.

There are several factors that predispose to *chronic lead poisoning:* The young are peculiarly susceptible to the presence of lead. The colored race is more susceptible to lead poisoning than the white. A colored man, aged thirty-nine years, melting battery plates, noticed in five days after starting work that his appetite began to fail. Then he began to have pains in his knees and wrists and abdomen. These pains were described

as being located on the anterior surface of his body. In three months he had to stop this type of work. His hemoglobin was 78 per cent; red blood cells, 3,390,000; white blood cells, 6400. There was neither a lead line nor basophilic stippling; the urine and stool showed lead in abnormal amounts.

Crossetti, Lorenzo and Forgoni[1] report that ulcerative gastric and duodenal processes were not observed. The roentgenologic examination was always negative. In my series of 400

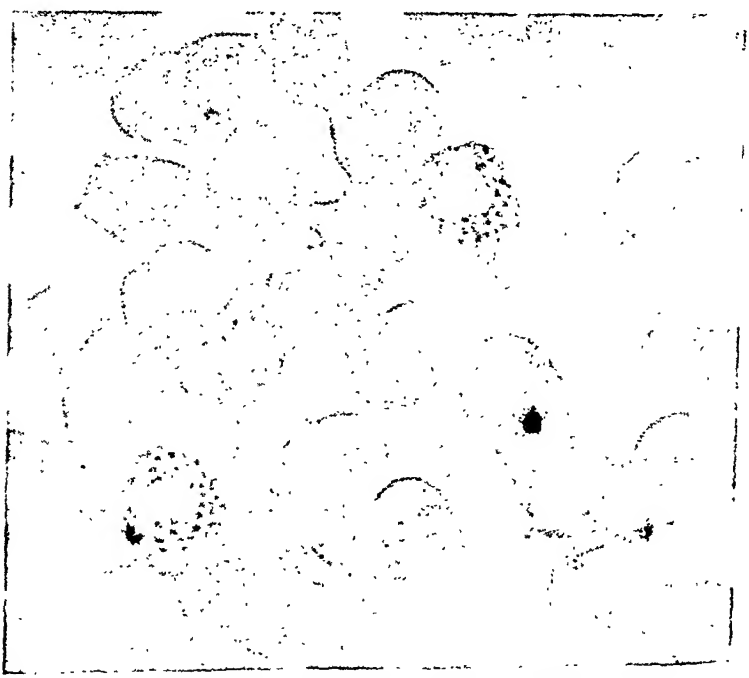

Fig. 32.—Basophilic stippling in lead poisoning (Wright stain).

cases I found 4 per cent with gastric ulcers from *x*-ray examinations of men giving histories of disturbances of digestion. Though no histories of gastric disturbances were given in some of the other cases, should they come to autopsy they might show scars of old healed ulcers, inasmuch as 6.9 per cent of all people have gastric ulcers, while 5.3 per cent have duodenal ulcers.

[1] Crossetti, Lorenzo and Forgoni: Policlinico (sez. med.), 41: 516, 1934.

In cases that came under my observation, the liver did not show any characteristic changes. Where there was *jaundice,* some other metal might have been responsible for the damage to the liver. Lead encephalopathy is seen rarely; it occurs where there is an excessive exposure to lead dust or fumes.

Treatment.—De-leading can be accomplished by a diet which contains very little calcium. Doses of 20 cc. of diluted phosphoric acid (placed in water and sweetened) should be given in a glass of water every hour about ten times daily for several weeks. If acidosis becomes too severe, the medication should be reduced. One gram of ammonium chloride has increased the average excretion of lead threefold. Sodium bicarbonate, 20 to 40 Gm. a day, produces an effect similar to that of potassium iodide.

For the treatment of *palsy,* give calcium gluconate intravenously, 1 Gm. dissolved in 10 cc. of water. The patient can be given calcium gluconate wafers, one every hour during the day, which assist in immobilizing the lead. An encephalopathy should be treated by methods aiming to fix the lead. I formerly used thiosulfate intravenously, but have found that 0.50 Gm. of sodium tetrathionate, or calcium gluconate, gives better results.

CARBON MONOXIDE POISONING

Deaths from carbon monoxide inhalation in private garages are increasing, while deaths in homes due to accidental or intentional use of this gas are waning. For instance, in 1935 in Cook County there were seventy-four deaths due to carbon monoxide poisoning, of which forty-six were due to auto gas; in 1938 there were fifty-four deaths, twenty-two being due to auto gas.

In the atmosphere, carbon monoxide is not readily detectable because it is colorless, practically odorless, and tasteless. Its density, compared to air, is 0.967. Carbon monoxide is produced in the incomplete combustion of carbonaceous material. It is produced during electric welding and in electric furnaces having limestone linings; the carbon dioxide is reduced to carbon monoxide at the heated electrodes, the gas escaping unburned.

The most common *sources of carbon monoxide* are stoves, grates, salamanders, domestic and industrial furnaces, distil-

lation of oil, gas engines, fumes, explosions, burning x-ray films, smouldering ashes and mine coal, and artificial gas. It is formed whenever incomplete combustion of carbon occurs, such as fumes on besooted surfaces and low-burning oil lamps. The average carbon monoxide content of exhaust gas of automobiles was found by the Bureau of Mines to be 7 per cent. Wilson and his colleagues demonstrated carbon monoxide in the blood of fourteen traffic policemen, in six of whom the amount ran from 20 per cent to 30 per cent carbon monoxide hemoglobin (HbCO). The safe limit for carbon monoxide in the air is given by Haldane,[1] who studied conditions in the London Underground Railway, as 0.01 per cent for continuous exposure.

Symptoms.—The symptoms of carbon monoxide poisoning *may simulate many other conditions,* such as food poisoning, strychnine poisoning, diabetes and alcoholism. In fact, the symptoms are so varied that they remind one of diseases of the brain, spinal cord, lungs, kidneys, liver, and skin.

The onset of symptoms may be sudden, but usually there are *warning sensations,* such as headache, throbbing of the temples, ringing in the ears, faintness, dizziness, loss of appetite, palpitation of the heart, reduction of visual acuity and vomiting.

The face then becomes red, there is *loss of memory, vertigo, fainting, anesthesia,* and *loss of all spontaneous power of movement. The heart action is at first violent,* then *weak, slow,* and *arrested. The body temperature is lowered.*

Recovery is sometimes rapid, but usually there is a slow return to consciousness, with more or less prolonged headache, nausea, and weakness. Symptoms may continue for several days. Where the gas has been inhaled for a considerable length of time, the red patches on the skin will remain for quite a while. The paralysis and anesthesia begin in the lower extremities and rise to the trunk. The loss of power and sensibility is frequently shown by the severe burns received by a person falling on a gas or other stove or a brazier. Loss of consciousness is often sudden. At other times there is a slowly increasing drowsiness. There is a great similarity in the symptoms to those of drunkenness. Recovery may in some cases

[1] Haldane, J. S.: Brit. Med. Jour., 2: 16, 1930.

follow a protracted sojourn in a not too poisonous atmosphere, while others, after an hour or two of inhalation, cannot be brought to life. While most have no remembrance of symptoms, many claim to have suffered greatly.

Death follows from paralysis of the respiratory apparatus. When the gas itself does not kill, apoplexy or softening of the brain may follow. Pneumonia not infrequently follows the intoxication (this was more common before the use of oxygen and carbon dioxide treatment). According to Becker and Schwerin, the *sequelae* are divided into four groups: (1) primary gangrene with blisters and decubitus; (2) primary hemorrhages, as of the lungs, apoplexy, and the like; (3) a persistent distention of the capillaries and other vessels, in which the symptoms are shown in the skin, red nose, red spots not unlike those caused by frostbite; (4) a deep-seated disturbance of the regeneration of all organs, especially of the vascular walls and the ganglion cells of the nervous system, evidenced by secondary hemorrhages, idiocy, imbecility, chorea, ascending paralysis, etc.

Chronic Carbon Monoxide Poisoning.—The *symptoms* are described as an alteration in the digestion, headaches, diminished vigor, gray color of the skin, coated tongue, loss of memory, diminution of the psychic powers, and occasional convulsions.

The pathologic findings at autopsies have shown, in some cases, fatty degeneration, in others, pernicious anemia. Bect and Fort[1] reported two cases of chronic carbon monoxide poisoning with a blood picture simulating a pernicious anemia. Pilman[2] gives a detailed report of the examination of thirty-six men working in an atmosphere containing an excess of carbon monoxide. Eight had vascular dilatation in the fundus. Only two had normal visual fields, and contraction first appearing for color and later for form; repeated examinations demonstrated the progressive tendency of the visual field changes. Amblyopia was reported from the inhalation of carbon monoxide gas by Murray.[3]

[1] Bect, H. G. and Fort, W.: Am. J. Clin. Med., 3: 437, 1934.

[2] Pilman, H.: Abstr. from Sovet. vestnik. oftal., 4: 433, 1934, in Am. J. Ophth., 17: 1191, 1934.

[3] Murray, W. R.: Minnesota Med., 9: 561, 1926.

Treatment.—Grehant[1] found that respiration of pure oxygen eliminated carbon monoxide four times as fast as when atmosphere was breathed. Ten per cent of carbon dioxide and 90 per cent oxygen is more effectual than the 5 per cent mixture of carbon dioxide. If the patient does not respond in one-half hour to this treatment, the prognosis is grave. A truck driver exposed to the fumes of carbon monoxide in his cab for a period of five hours, was found unconscious and taken to a hospital where oxygen and 5 per cent carbon dioxide was administered for three hours. But in spite of this treatment his breathing became more labored, his pulse more rapid, the temperature rose and death ensued.

Chronic cases of carbon monoxide poisoning must be treated symptomatically. The cause of the chronic intoxication should be remedied by an industrial survey conducted by engineers and chemists.

Lethal Dose.—The maximum safe concentration for long exposures to carbon monoxide is 0.01 per cent. It is possible to breathe 0.05 per cent to 0.1 per cent for one-half to one hour without any serious effects. But, as the blood becomes saturated from 47 per cent to 53 per cent with this concentration in three to four hours, definite symptoms of intoxication develop. Serious illness is caused by the inhalation of 0.2 to 0.3 per cent in one-half to one hour, while 0.5 to 1 per cent may cause death in two to fifteen minutes.

Sequelae of Carbon Monoxide Poisoning.—The great majority of victims of carbon monoxide asphyxia recover without any lasting symptoms; there are, however, exceptional cases in which structural damage has occurred, usually as a result of slow and prolonged asphyxia. *Loss of memory* and *lack of judgment* are definite symptoms of carbon monoxide poisoning, both while the victim is under its influence and after his recovery. This condition is also seen in individuals recovering from an overdose of protamine insulin. *Epileptoid convulsions* may be a symptom, not of the early stage, but of the stage of recovery.

Coronary disease seems to be more prevalent in firemen than in those engaged in other occupations. This may be due to their frequent inhalation of toxic doses of carbon monoxide.

[1] Grehant: Compt. rend. Acad. d. Sc., 132: 574, 1901.

While coronary disease does occur more frequently in firemen, it also has been on the increase among the general public in the last few years, the mortality ranging from 4.7 to 18.8 per 100,000 in a five-year period ending in 1934. This figure without a doubt will be increased in the next statistical report. *Anemia* resulting from repeated inhalation of carbon monoxide could be a causative factor in the development of coronary disease. Angina pectoris occurring in the course of certain anemias has been reported by several authors.

Mankowsky[1] attributed the *polyneuritis* that follows carbon monoxide asphyxia in some cases to hemorrhages compressing the nerves, causing infiltration of the epineurium and perineurium with ischemia, the symptoms ceasing as the exudate is absorbed. Wilson and Winkelman found both polyneuritis and involvement of the cortex, or of the globus pallidus or of both, as shown by exaggeration of the deep reflexes. *Cardiac symptoms* are not all unusual immediately after severe gassing, and they may be long continued or even permanent, pointing to a myocarditis or even atheroma of the coronaries as a sequelae.

BARBITURATE POISONING

Symptoms.—Barbital is excreted slowly; consequently continued doses may produce serious cumulative effects. Barbital has caused conditions resembling alcoholic intoxication, disturbances of speech, delusion, tremor, ataxia, and loss of memory. Repeated doses of 1½ gr. have caused loss of weight, anemia, hematoporphyrinuria, and oliguria. Postoperatively, patients given barbiturates developed dullness, nausea, skin rashes and occasionally a marked depressing effect from 1½ gr. twenty-four hours after taking the drug.

Diagnosis.—Owing to constricted pupils, the physician may confuse barbituric acid poisoning with opium poisoning. However, in several cases which I have seen the pupils were widely dilated. Disturbances of vision may be present for a number of days. Occasionally restless sleep, trismus, delirium, and rise of temperature—have suggested uremic coma and sometimes pneumonia. From the administration of 1½ gr. I

[1] Mankowsky, B. N.: Deutsche Ztschr. f. Nervenh., 109: 84, 1929; abstr., J.A.M.A., 93: 1513, 1929.

have seen mild erythema resembling a scarlet-fever rash. It disappeared, however, a few days after the discontinuance of the drug.

Treatment.—Injections of 1/30 gr. of *strychnine* to combat the toxic effects of barbituric acid derivatives usually give good results. *Metrazol* (400 mg.) and *picrotoxin* (5 to 10 mg.) may be given every two to six hours.

The stomach should be washed out, and high colonic flushings and diuretics given. Injections of *camphor, caffeine with sodium benzoate,* and *other cardiac and vascular stimulants* should be given.

MERCURY POISONING

Where the symptoms point to a metallic poisoning, the diagnosis of acute mercurial poisoning is made easier by the use of the *Reinsch test.* The Reinsch test is simple and can be run in any physician's office where gas is available. The test is performed by boiling a sample of the vomitus, urine, stool, or suspected food in a beaker or evaporating dish with a strip of copper foil; this is decanted, the foil washed with water, alcohol and ether, and placed in the long end of a prepared small glass tube as shown in Fig. 33.

This glass tube is made from a piece of tubing 3/8 by 6 inches long. Capillary constriction is drawn so that the long portion of the tube is 3½ inches, the capillary about ¾ of an inch in length, and the short end of the tube 1½ to 2 inches. The copper foil is placed in the long arm of the tube, and the capillary refrigerated by a strip of filter paper dipped in cold water. The finger tip is held over the opening in the long portion of the tube and heat applied beneath the copper strip. Arsenic is deposited as octahedral crystals. Mercury is deposited as small silvery globules which can be easily seen under the low power of the microscope. Fig. 33 shows the tube with the copper foil when it has been heated, Fig. 34 the octahedral crystal of arsenic, and Fig. 35 the globules of mercury. Controls can be run with known specimens of arsenic and mercury. The test does not differentiate mercurous from mercuric mercury.

Symptoms.—When mercury is taken by mouth, *the symptoms usually appear within a few minutes.* There is a strong

Fig. 33.—McNally tube for Reinsch test. (Jour. Ind. State Med. Assoc., 31: 12, 683–691 (Dec.), 1938.)

metallic taste, constriction in the throat, retching, and a burning sensation in the gullet and stomach. A white coating forms

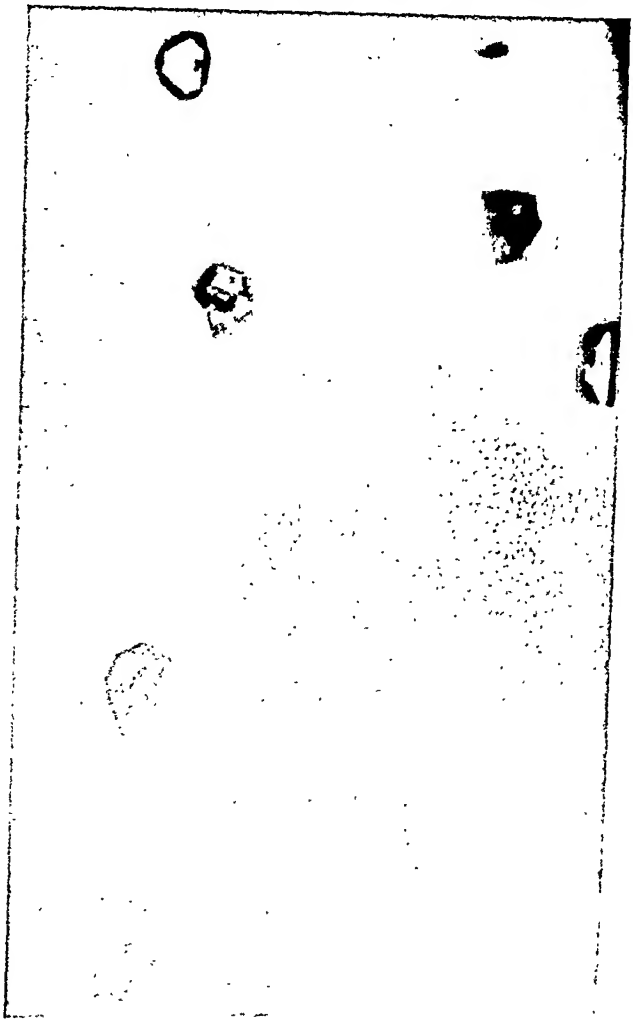

Fig. 34.—Arsenic crystals (Reinsch test).

at once on the shriveled lining of the mouth, the inflammation of the throat may involve the larynx, and acute swelling of the glottis may cause asphyxia. The pain in the stomach is so

severe as to cause fainting. Vomiting may occur within five minutes, and later purging and straining with bloody stools.

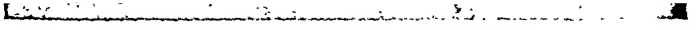

Fig. 35.—Globules of mercury (Reinsch test).

There may be hemorrhages from the mouth, stomach, and bowels. I have seen mucous patches as large as one's hand

discharged from the bowel. The urine is scanty and suppressed, temperature may be febrile or subnormal, respiration difficult, the pulse thready and irregular. Death is preceded by collapse, unconsciousness, or convulsions. A decrease in the chlorine content of the blood and a decrease of the alkaline reserve due to acidosis is found.

To show the progress made in the treatment, the blood chemistry is a valuable aid. The normal nonprotein nitrogen per 100 cc. of blood is 25 to 35 mg. In mercurial poisoning we see this jump from the 80's on the third day to over 200 mg. on the tenth day. This is a bad prognosis, as the patient usually dies. However, if the nonprotein nitrogen begins to go down after the seventh day, you may be certain that the patient will recover. The urea nitrogen is normally from 12 to 14 mg. This may increase suddenly to 70 mg. on the third day and to over 170 mg. on the tenth day in bad cases. In fact, all of the constituents, the urea-N, ammonia and amino-N, uric acid-N, and creatinine-N of the blood, are nearly doubled.

Treatment.—*In all cases seen within an hour,* the whites of two eggs in a pint of milk should be given per mouth and aspirated in five minutes. (Skimmed milk should be used since all fats dissolve mercury salts and aid in their absorption.)

Before leaving your office, telephone the patient and instruct him to take milk and induce vomiting without delay or have relatives forcibly give milk in case of attempted suicide. A second portion of milk and eggs should be given, allowed to remain in the stomach for ten minutes, then pumped out. While waiting, 0.5 Gm. of sodium thiosulfate should be given intravenously, repeated in ten hours and daily for a period of four to five days.

After aspiration of the second pint of milk, wash out the stomach every four hours with a quart of water containing 8 grains of calcium sulfide. Colonic flushings, consisting of 1 gallon of water, should be given every eight hours, using 4 grains of calcium sulfide to each pint. Colonic flushings and gastric lavages are continued until the Reinsch test fails to show mercury.

The *absorption therapy* of animal or blood charcoal should

be used when cases are seen early. One gram of Merck's "Carbo Medicinalis" will bind 850 mg. of bichloride of mercury, 580 mg. of strychnine, or 40 to 45 mg. of phenol. Whatever treatment is instituted, it calls for the intravenous injection of sodium chloride due to chlorine impoverishment of the blood. This can be given with glucose, which stimulates the secretion of urine.

ARSENIC POISONING

Symptoms.—The first symptoms of acute arsenical poisoning are those of a *violent irritant* producing an inflammation of the gastro-intestinal tract. If death occurs within twenty-four hours, there may be added to these symptoms, or occurring independently, *collapse* and *coma*, due to the involvement of the central nervous system. The patient complains of an *excruciating pain in the pit of the stomach*. There may be sensations of nausea preceding or accompanying the pain; a feeling of dryness, burning, and irritation in the mouth; and persistent or forcible vomiting. The patient is unable to support the blandest of drinks; the vomitus may be a water-like fluid containing mucus, bile, or even streaked with blood. A continuation of the vomiting and abdominal pains is followed by a profuse diarrhea and painful tenesmus. The shreds of mucus and coagulated exudation give to the evacuation the character of "rice water" stools. The picture at this time looks like cholera, and can be distinguished by a chemical examination of the excreta.

Treatment.—Recovery is possible from 3 gr. or more. However, where poor health is present, it would be possible to cause death with a much smaller dose.

If vomiting has not already taken place, an *emetic* mixture of a teaspoonful of mustard and a tablespoonful of salt in a tumbler of warm water may be given. *Then the stomach should be washed out immediately*, preferably with colloidal ferric hydroxide suspension, as this antidote may delay absorption of the arsenic through its adsorption. This antidote can be prepared by adding magnesium oxide to a tincture of ferric chloride, or to a solution of ferric sulfate.

Thiosulfate should be given intravenously, 15 gr. in 10 cc. of water, repeating four hours later. Give *colonic flushings*

of 4 gr. of calcium sulfide to a pint of water. If the diarrhea is so pronounced as to cause dehydration of the patient, *hypodermoclysis* should be resorted to, giving 1000 cc. of physiologic salt solution with 5 per cent glucose, or 5 per cent sodium bicarbonate intravenously by the drop method.

In extreme weakness, give 100 cc. of a 50 per cent *glucose solution* intravenously in place of the former.

The patient should be treated symptomatically, giving *caffeine with sodium benzoate* or *strychnine* as the occasion may require.

Medical Clinics of North America
January, 1940. Chicago Number

CLINIC OF DR. L. FELDMAN

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JAUNDICE AS AN EARLY FINDING IN CORONARY OCCLUSION

WE are fortunate in having for the clinic this morning a patient who was in the hospital about a year ago and who has been since followed in the out-patient department:

L. F., Jewish, married, a fruit peddler of forty-two years, entered the Mount Sinai Hospital on the service of Dr. I. M. Trace on April 30, 1938, with the complaints of substernal and right upper quadrant pain, jaundice, and weakness of four days' duration. He had always considered himself healthy and had had no symptoms referable to his heart or gastro-intestinal tract until the afternoon of April 26, when he suddenly developed a vise-like pressing pain under the sternum. This was associated with weakness and sweating. He climbed down from his wagon and lay down on the grass. In from forty to sixty minutes the pain subsided to a certain degree, and he proceeded with his work, although he felt weak and exhausted. There was no nausea or vomiting, nor was there any radiation of the pain.

His appetite for his evening meal was poor, but he managed to eat some food. He retired early, but was restless all night because of substernal discomfort. Upon arising in the morning, he also began experiencing pain in right upper quadrant. This was a dull ache aggravated by breathing and sitting up. At the same time he noticed that he was jaundiced. A physician was called and he made a diagnosis of gallbladder disease. On the fourth day of the patient's illness he entered the hospital. The past history was of no importance, and as has been said, he definitely denied any previous complaints referable to the heart or gastro-intestinal tract.

Physical examination revealed a thin, sparsely built man who was moderately icteric. His respirations were 20 and regular; his pulse was 72 with frequent dropped beats. The blood pressure was 110 systolic and 70 diastolic. The pupils, thyroid and throat were not abnormal. The sclerae were icteric. The veins of the neck were not distended, and unfortunately the venous pressure was not taken. The patient's teeth were in fair condition. The temperature was 98.6° F.

The heart was small, measuring 3 cm. to the right and 9.5 cm. to the left of the mid-sternal line. There was no increased supracardiac dullness. The apex was not felt; tones were somewhat distant and there was a short systolic murmur at the apex. There were frequent dropped beats. No accentuation of basal sounds was elicited, nor was a friction rub. The right diaphragm stood somewhat higher than normally, and there were a few moist râles in both lung bases.

On abdominal examination the liver was found four finger-breadths below the costal arch; it was very tender and had a sharp and smooth edge. The spleen was not felt, and there was no edema of the extremities or back. The reflexes were normal. Rectal and genital examination revealed no abnormalities. The skin was moderately icteric, and the patient volunteered the information that he was much more "yellow" during the first few days of his illness. There were no scratch marks.

Coronary occlusion involving the right artery was strongly suspected, for reasons discussed below, and this diagnosis was soon corroborated by the electrocardiographic findings (Figs. 36, 37). The jaundice was ascribed to the acute congestion of the liver.

The patient having been admitted on Saturday, the various diagnostic procedures, except the electrocardiogram (Fig. 36), were not carried out until Monday—the sixth day following the attack of substernal pain. By this time the jaundice was visibly subsiding. The icterus index on this day was 19.5 mg. per 100 cc. of blood and the van den Bergh test showed faint delayed direct reaction. The blood cholesterol was 181 mg. per 100 cc.; the blood sugar was 83 mg. and the blood urea 13.6 mg. The sedimentation rate was 60 mm. (20 mm. being

normal). The Kahn and Wassermann reactions were negative. The urine showed no albumin, sugar, or bile, but uro-

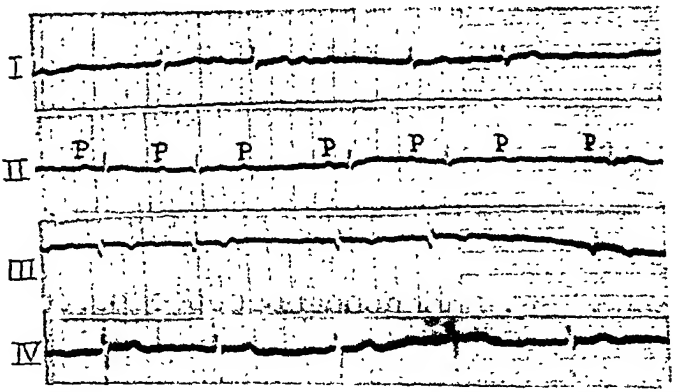

Fig. 36.—Low voltage rate 70. Progressive prolongation of the P–R interval with, finally, a dropped ventricular beat (Wenckebach period). Slight sinus arrhythmia. Q2 is present; Q3 is prominent; T1 is upright; T2 is flattened; and T3 inverted and S–T3 slightly elevated. Lead IV is normal. Record taken April 30—four days after the onset of pain.

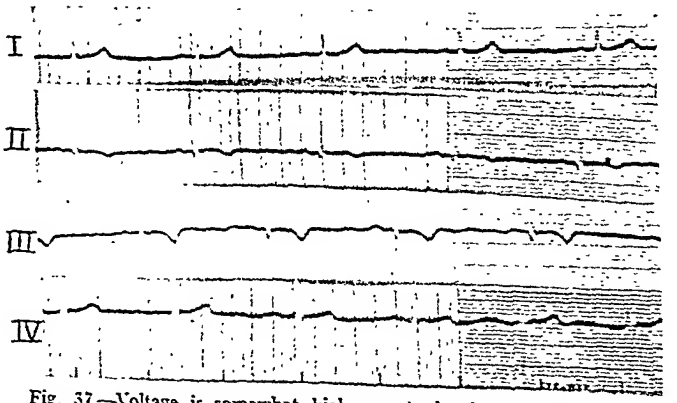

Fig. 37.—Voltage is somewhat higher; rate is about same. Still slight sinus arrhythmia present. No A–V conduction disturbance. P–R interval is about .20 second; T2 has become inverted. Lead IV is same. Conclusion: Evidence of posterior infarction. Record taken May 4—eight days after the onset.

bilinogen was increased, the microscopic being negative. The stool was of normal color, positive for urobilinogen and nega-

tive for blood. A blood count revealed: Hemoglobin 90 per cent, red blood corpuscles 4,500,000 and white blood corpuscles 9800 per cubic millimeter, with polymorphonuclears 69 per cent and lymphocytes 30 per cent.

On the following day, May 1, the patient appeared less jaundiced, but he still complained of some substernal distress and discomfort in the right upper quadrant. The liver was not as tender but the heart findings were not changed. From this day on the patient kept on improving. His heart became regular five days after admission, and eight days after the attack. The liver began to recede, and by May 7, eleven days after the onset, it was barely palpable. The jaundice was gone. The substernal and right upper quadrant discomfort disappeared and the patient protested at being kept in bed. His heart remained regular, and the sounds became clearer and louder. The electrocardiogram at this time (Fig. 37) showed somewhat higher voltage, sinus rhythm, but there was a sign of progression as evidenced by an inverted T2. Thus the pattern was like that of an infarction of the posterior surface of the heart. On June 1, before the patient's discharge from the hospital, the gallbladder was studied and it showed normal visualization. This procedure was really not indicated, for no matter what the outcome of the test might have been, the fact remained that the jaundice was not of the type caused by obstruction of the common duct.

Since the patient's discharge he has been followed in the out-patient department. He is working at a lighter occupation. But as soon as harder work is undertaken, angina is experienced.

COMMENT

Hyperbilirubinemia is present in practically all cases of congestive heart failure. Frequently it is high enough to produce obvious jaundice.[1] This is usually associated with long-standing congestive failure. But as an early finding in coronary occlusion, jaundice is rare.

In a brief survey of the literature, only a few cases were encountered in which jaundice was mentioned without long-standing congestive failure. In one case[2] jaundice was discussed as a prominent feature, appearing two days after the

attack. It was described as "faint but distinct." Sudden death occurred two weeks later. In another case[3] jaundice was so marked that a prominent cardiologist believed that a coincident common duct stone was present. The jaundice appeared four days after the onset and disappeared by the ninth day. Autopsy revealed an infarction involving the posterior surface of the left ventricle and one half of the interventricular septum. The electrocardiogram was typical for such a lesion.

In the rest of the recorded cases jaundice was not prominent and was barely mentioned. Levine,[4] in his published reports of 145 cases of coronary thrombosis, observed only one case in which there was any suggestion of jaundice—"the sclerae being slightly icteric." Wearn[5] observed jaundice in two of his nineteen cases. Faulkner, Marble and White[6] found jaundice in three out of thirty cases of coronary occlusion. Levy,[7] in his chapter on coronary occlusion in his book states, "occasionally jaundice may appear." Robey[8] held that jaundice is not seen in coronary thrombosis unless congestion is present for a long time. In his Lumleian lectures in 1910, Osler[9] mentioned three cases in which there was jaundice; Neusser[10] in his monograph on angina pectoris referred to a patient who had an enlarged liver and a subicteric color.

Ernstene,[11] in his discussion of bilirubinemia in heart disease, does not even mention the occurrence of jaundice in coronary occlusion, nor does Fishberg[12] in his textbook on heart diseases. White[13] merely states that the tint of the skin "may suggest slight jaundice." It seems that jaundice is an accepted feature in coronary occlusion, but it is rather infrequent and is usually faint when it does appear. On the other hand, when it is marked or even moderate, it may confuse the physician and lead to an erroneous diagnosis, as exemplified by the case reported.

In the present case a diagnosis of coronary occlusion instead of biliary disease was strongly suspected upon admission before the electrocardiogram and other diagnostic procedures were carried out. This was arrived at after a careful analysis of the findings and their chronologic sequence.

The pain was not helpful in the differential diagnosis, for either of the conditions could give the same type of pain, more or less. The appearance of jaundice following the pain was

certainly in favor of cholecystic disease, since it is such a frequent finding in the latter condition and a rare finding in coronary occlusion. The cardiac irregularity could have erroneously been taken as a sign of biliary disease, presumably as a reflex phenomenon. Experimentally this has been produced in animals[14] and on the operating table.[15] The absence of any history of indigestion was rather against cholecystic disease in a sparsely built man. On the other hand, the similar absence of previous cardiac complaints was not against coronary disease.

It was the enlarged and acutely tender liver which, according to the history, appeared in less than twenty-four hours after the attack of substernal pain that favored the diagnosis of coronary occlusion. Moreover, it spoke for a thrombosis of the right coronary artery, necessarily involving a big branch or the main artery in order to produce sudden and acute right heart failure with the resultant liver engorgement.[16] The next line of reasoning was that the dropped heart beats were probably due to disturbance of conduction, producing a partial auriculoventricular block. For when this occurs in the course of coronary heart disease, involvement of the right coronary artery is almost always the cause.[17]

Now, common duct stone may give an enlarged and tender liver, but usually only after many days or weeks of the disease. The jaundice usually deepens, fluctuations are not uncommon, and chills and fever are not infrequent. In the present case there was a discrepancy between the hepatomegalia and the degree of jaundice, although we have alluded to the fact that his jaundice was beginning to decline when the patient entered the hospital.

The jaundice in this case was ascribed to the acute liver congestion and, since it occurred in about sixteen hours following the onset of substernal pain, the possibility of pulmonary infarction as a contributory factor was discarded. Besides, clinically there was no suggestion of such a complication. Because of the anoxemia, the liver is unable to excrete all of the bilirubin brought to it by the blood.[11] Microscopically, the cells show cloudy swelling and some atrophy, but the bile ducts are patent. As soon as the congestion lessens, the function of the liver cells improves and the jaundice disappears.[18]

According to Fishberg[1] and Ernstene,[11] jaundice in diseases of the heart is usually of the retention type[18] which is characterized by the absence of bilirubin and bile salts from the urine and by the indirect van den Bergh reaction of the blood. Rich[18] states that, in retention jaundice, besides the depressed function of the liver there is also an increase in bilirubin formation, as evidenced by its increased concentration in the blood and by the increased excretion of urobilin in the urine and the stools. In disease of the heart, the source of this increased bilirubin formation is the increased destruction of the red cells.[1] In severe cardiac decompensation, there may occur necrosis of the liver cells with resultant regurgitant jaundice,[18] meaning a reflux of whole bile from injured bile canaliculi into the blood stream. In this type of jaundice there is bile in the urine and the van den Bergh reaction of the blood is usually direct. Ernstene[11] mentions such a case, and Halsted and Bauer's case[3] showed such a jaundice.

The presence of increased amounts of urobilinogen and urobilin in the urine and feces, the absence of bilirubin from the urine, and the normal cholesterol of the blood spoke against obstructive jaundice in the case reported. This was of paramount help to us, since the latter diagnosis was rejected; otherwise, it could have been argued that, besides coronary occlusion, coincident common duct obstruction was also present.

The jaundice here, then, was not unlike that of the retention type, and is in line with Ernstene's[11] findings except for the faint delayed direct van den Bergh. It is possible that some slight degree of necrosis of the liver also occurred, thus giving such a reading. Had the icterus index been higher, bile would probably have appeared in the urine also. Mixed types of jaundice are known to occur.[18]

Hence the clinical aspects, the electrocardiographic findings, the laboratory tests, and the course of the disease all indicated the diagnosis of coronary occlusion with the rare complication of jaundice. The course of the disease also brought out certain well known facts: The transient nature of the arrhythmia in coronary thrombosis is recognized. The A–V node is normally supplied by a branch from the right coronary artery in about 90 per cent of the cases. In the rest, and in the event of disease of this artery, the left artery comes

to the rescue.[17] The shrinkage of the liver with the disappearance of the jaundice speak for the establishment of collateral blood supply to the right heart. The source of this new blood supply is the left coronary artery, through the anastomotic zone in the anterior interventricular groove, as has been recently shown by Schlesinger.[19] By his ingenious injection method he has shown that the compensatory blood supply to the heart usually comes from the left coronary artery, no matter where the occlusion may be.

CONCLUSIONS

1. A case of coronary occlusion with early jaundice is reported.
2. The latter may confuse the physician and lead to an erroneous diagnosis.
3. The partial heart block and the enlarged liver indicated involvement of the right coronary artery.
4. The jaundice was explained on the basis of anoxemia of the liver cells.
5. The increase of urobilinogen in the urine and the absence of bilirubin spoke against obstruction of the common duct.
6. The disappearance of the arrhythmia, hepatomegaly and jaundice was explained on the basis of establishment of collateral circulation to the A–V node and the right ventricle.

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Medical Clinics of North America
January, 1940. Chicago Number

CLINIC OF DR. HERBERT E. SCHMITZ

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RADIOLOGIC TREATMENT OF CARCINOMA OF THE UTERINE CERVIX

MORE than twenty-five years ago two American gynecologists Howard Kelly and Henry Schmitz, published simultaneous articles in the Journal of the American Medical Association telling of their experience in treating carcinoma of the cervix with radiation therapy. In these early days only the far advanced or inoperable cases were treated by this method. Surgical removal of the diseased organ was the approved method and this new treatment, made possible by the discoveries of Conrad Roentgen and the Curies, was looked upon as impractical and dangerous. The true scientific spirit manifest in these pioneers soon brought other workers into the field and, with the development of technic and apparatus, the careful follow up, as carried on by these clinicians, showed that here was a treatment which gave end results as satisfactory as those obtained by the surgeon. The greatest factor responsible for the ultimate acceptance of radiation therapy as the treatment of choice was the lower mortality rate. The fact that this treatment was less difficult to carry out and that it was not limited to the clearly localized cases won for it the place it now holds as the treatment of choice in malignant disease of the uterine cervix.

Grouping of Carcinomas.—In order, clearly to divide all cases for treatment and follow up, a method of grouping carcinomas was introduced in our Clinic. This grouping is based on the clinical findings of the extent of the tumor by palpation and inspection, as follows:

1. *Beginning nodule or ulcer,* not larger than 1 cm. in diameter, with normal mobility of uterus and adnexa. Mobility is determined by attaching a tenaculum to the cervix and

drawing the uterus downward. A freely movable uterus will descend into the vagina so that the cervix is visible at the introitus.

2. *A tumor or ulcer involving one-half or all of the cervix in either the transverse or the longitudinal diameter,* and a *dough-like consistency of the paracervical tissue.* The uterus then assumes a decreased mobility due to loss of normal elasticity of the adjacent connective tissue.

3. (*a*) *Tumor or crater of the cervix with rigidity of adjacent tissues;*

(*b*) *Involvement of the parametria, regional lymph nodes, or both.* The mass as a whole has impeded mobility.

4. (*a*) *Involvement of the parametria, regional lymph nodes, or both, with fixation;*

(*b*) *Involvement of the bladder, rectum* or *vagina;* and

(*c*) *Distant metastasis.*

By grouping cases in this fashion we immediately divide the four groups into the *operable* and *inoperable.* Considering 1 and 2 in the former, we then find in studying the world statistics that only 25 per cent of all cases fall in this class. Further investigation reveals a surgical mortality of from 9.5 to 21.4 per cent. Every operator must acknowledge a mortality of 20 per cent in his first hundred cases. Clinics reporting on large series of cases in the operable group, where 50 per cent were treated by surgery and an equal number by radiation, report five-year cures of 43.5 per cent in those treated surgically, with a primary mortality of 18 per cent in the Wertheim operation and 1.5 per cent in the vaginal procedure of Schauta. The five-year cures in the cases treated with radiation was 42 per cent and the primary mortality rate 1.16 per cent.

Contraindications to Radiation Therapy.—The contraindications to the use of radiation are:

1. *General Emaciation* and *Cachexia.*—When these are present, radiations may cause a rapid increase of both and early death.

2. *Anemia,* with a red cell count below 3,000,000 and a hemoglobin below 50 per cent. Radiations have a tendency to produce an oligo-erythrocythemia and leukopenia and hence may increase the anemia to a danger point.

3. *Impaired Nitrogen Metabolism.*—Radiations as a rule produce a rapid increase in the blood nitrogen, which may assume dangerous proportions in the presence of an impaired nitrogen metabolism.

4. *Complications in the Urinary and Rectal Tract.*—Bullous edema and carcinomatous involvement of the bladder or the rectal mucous membrane, fistulas, and urinary retention due to obstruction or cancer invasion of ureter and kidney, either with or without infection, are made worse by radiation, irritation and fibrosis.

5. The frozen fixed pelvis is usually an indication of an existing *generalized carcinomatosis.* External irradiation may be employed palliatively.

6. The presence of *inflammatory lesions,* or a *foul sloughing condition of growth or pyometria.* The pyometria should always be drained by a rubber tube in the cervix. External irradiation is indicated when the patient is again afebrile.

7. *Amenorrhea and Pregnancy.*—Radiations are detrimental to the normal development of the fetus.

Some of these conditions may be overcome by proper medical treatment, when radiations may be used.

The rules given have been carefully observed in our Clinic. Variations in the subjective interpretation of operability and inoperability have thereby been reduced to a negligible number. Since 1917, operations for carcinoma of the cervix uteri have been discarded, and all patients, except those in Group 4, have been treated with radium and *x*-rays. The low percentage of absolute operability, the high frequency of contraindications to surgical treatment, and the good end results of radiation treatment were the reasons for this decision. Should a carcinoma of the cervix uteri of Group 1 or 2 prove refractory to radiation therapy then operation may be considered to offer the patient a possible chance of relief.

Scattered Fractional Method of Irradiation.—The scattered fraction method of applying *x*-rays has been used in our Clinic for the past nineteen years. The *advantages* of this method are: (1) Large total doses can be applied without permanent injury to the normal structures. The total dose may be from two to three erythema doses. (2) The cancer cell is hit by the rays during the most radiosensitive stage,

which is the time of mitoses, occurring in highly undifferentiated embryonal cells about every six hours and in more mature cells about every twelve days. This is also known as the "karyokinetic index" of Proust and de Nabias, which is based on the ratio of the number of mitotic to the number of resting cells. The lower the index, the lower is the radiosensitiveness of tumors and the more protracted the treatment should be. (3) Normal tissues react with a mild fibrosis, a desirable attainment as it means the production of a defensive and phagocytic tissue.

GENERAL OUTLINE OF TREATMENT

The patient enters the hospital thirty-six hours before the scheduled time of treatment. A complete *blood count*, including a differential count, *blood chemistry* and *Wassermann test*, *virulency test of cervical and vaginal secretions*, *hydrogen ion determination of cervical and vaginal secretions*, *cystoscopy*, and *proctoscopy* are carried out.

If none of the contraindications to radiation therapy, as previously described, are present the patient is prepared surgically and is placed under gas anesthesia the next morning. *Vaginal and bimanual examinations* are again made and recorded. The position, mobility, consistency, shape and depth of the uterus, the direction of the uterine axis and the extent of the carcinoma are determined and entered on the tracing linen. Afterwards the *radium equal intensity curves* are entered. The linen tracing is then placed on the equal intensity curves of the roentgen rays, which are permanently cemented to a drawing board. Thereby it is possible to calculate the *total radiation dose* attained at any point within the pelvis. It should nowhere be higher than 4.5 E.D. throughout the radiation fields, and this dose must be scattered in fractions over fifteen to thirty days.

After dilatation of the cervical canal, a *biopsy specimen* is taken and the *radium capsule*, containing 50 mg. of element and having a wall thickness equal to 2 mm. of brass, is *placed intracervically*. Firm packing pushes the bladder and the rectal mucous membranes away as far as possible. A retention catheter is placed in the bladder to keep it empty. The radium insertions are repeated twice at eight-day intervals.

On the intervening days roentgen ray treatments are given. The duration of treatment depends on the calculations made on the tracing. The patient is permitted to be up and about during intervals between radiations.

Radiation sickness is not frequently seen. *Radiation cystitis* and *proctitis* occur almost invariably, usually at the time the entire treatment has been concluded. They are self-limited and terminate within two to three weeks. Lithium benzoate in 10 gm. doses, well diluted and given every three to four hours, relieves the bladder tenesmus. Radiation proctitis is best treated with suppositories of cocoa butter and opium, and a bland diet. In very severe cases fluid extract of coto bark, bismuth subtannate, and eventually deodorized tincture of opium in mistura cretae have given better results than any other medication. The skin erythema and epilation are treated with Dodd's lotion applied on cotton mornings and evenings. Profuse vaginal discharge reacts well to astringent douches.

The *diet* is a very important means of counteracting the systemic reactions due to radiation. Cod liver oil, viosterol, copper and iron, milk, meats, cereals, and fats are relied on. Vegetables and fruits are restricted.

Within six to twelve weeks the convalescent period should have ended and the cervix should be healed. If it has not healed we deem it unwise to repeat irradiations and rather prefer to remove the uterus if it can be done. However, should a *recurrence* occur after a primary healing, then the ulceration is treated with interstitial radiation. Platinum needles filled with one, two or three radium cells, each of 1 mg. element strength, are inserted at a spacing of 1 cm. from each other. For each estimated cc. of tissue, 120 mg. hrs. of radium is required. It is best to place the radium needles into the periphery and not into the active growth. Otherwise, it is not advisable to repeat a complete course of radiation treatment.

Latent *complications* are stenoses of the cervical canal with pyometra. The patients complain of a mid-pelvic pain, relieved by a sudden discharge of a large amount of purulent fluid. Dilatation of the canal and insertion of a rubber T drain will relieve the complication. Lateral pain in the pelvis usually indicates compression or invasion of ureters with retention hydronephrosis. Ureteral catheterization and pyel-

ography should be used to corroborate the clinical diagnosis. Dilatation of the ureter may cause temporary relief. In some instances in which the carcinoma had healed, resort to transplantation of the ureters was made. Several patients have thus been permanently relieved. Pressure on pelvic nerves is indicated by intense pain and often paralysis of the extremity. Repetition of the roentgen treatment may give the patient relief. Patients unable to walk on entrance to the hospital have reacted so speedily to the scattered fraction method that they left the hospital walking.

RESULTS OF TREATMENT

Improvement in x-ray apparatus has enabled us to increase our voltage from 140 K.V.P. to 200 K.V.P. and, at present, to 800 K.V.P. The Tabulation gives the results in each of these

TABULATION

PRIMARY CARCINOMAS OF UTERUS

A. Treated with 140 K.V.P. Rö., and 3000 to 4000 mg. el. hr. Ra, from May 1, 1920 to Dec. 31, 1921, showing results of treatment December 31, 1924. Treatments in continuous sittings lasting one week.

Spaced Roentgen Treatment

Clinical Groups	I	II	III	IV	Total
Number of patients	1	4	10	9	24
Number well	1	2	2	0	5
Percentage well	100.0	50.0	20.0	0.0	20.8

B. Treated with 200 K.V.P. Rö., and 4500 mg. el. hr. Ra, from May 1, 1926 to December 31, 1927, showing results of treatment December 31, 1930. Treatments spaced and fractioned over three weeks.

Spaced Roentgen and Radium Treatment

Clinical Groups	I	II	III	IV	Total
Number of patients	5	13	12	18	48
Number well	4	6	2	0	14
Percentage well	80.0	61.5	16.7	0.0	29.2

C. Treated with 800 K.V.P. Rö. from May 1, 1933 to December 31, 1934, showing the results of treatment September 30, 1937. Treatments given in 10 equal fractions during four weeks.

Spaced Roentgen Treatment

Clinical Groups	I	II	III	IV	Total
Number of patients	2	2	13	17	34
Number well	2	2	9	4	17
Percentage well	100.0	100.0	61.5	23.5	50.0

periods. Three- and four-year end results are compared, as the five-year results with 800 K.V.P. x-rays are being studied at present and will soon be ready for publication.

From the results for the clinical groups and the periods, it may be stated that the increase in the three- and four-year good end results is due to a marked increase in the percentage of arrested cases in Clinical Groups 3 and 4. The explanation of this observation may be the more homogeneous distribution of radiation intensities throughout the pelvis obtained by 800 K.V. maximum roentgen rays in comparison to those of 140 and 200 K.V. maximum roentgen rays and gamma rays of radium. The microscopic examination of tissues at stated intervals furnishes evidences of the intense influence of the 800 K.V. roentgen rays on the carcinoma cells. Further studies with 800 K.V. x-rays plus radium are now being carried on and will be reported in the near future.

CUMULATIVE INDEX